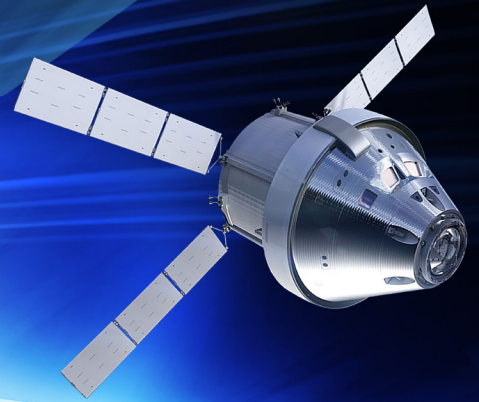


National Aeronautics and Space Administration



# A New Dawn : Enabling Human Space Exploration



# 2011



**NASA Human Research Program  
Investigators' Workshop**

**January 23-26, 2017  
Galveston Island  
Convention Center**



# **NASA Human Research Program Investigators' Workshop**

*A New Dawn: Enabling Human Space Exploration*

**January 23-26, 2017**  
**Galveston Island Convention Center**  
**Galveston, TX**

In conjunction with the  
**The 28<sup>th</sup> Annual Space Radiation Investigators' Workshop**

And the  
**2017 HRP Annual Awards Banquet**  
January 25, 2017

## **Sponsors**

NASA Human Research Program  
National Space Biomedical Research Institute

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# NASA Human Research Program Investigators' Workshop

## A New Dawn: Enabling Human Space Exploration

In conjunction with  
**Space Radiation Investigators' Workshop**

### Monday, January 23

7:00 a.m. Pre-function (1<sup>st</sup> floor)  
8:00 a.m. **Grand Ballroom**

8:05 a.m.  
8:10 a.m.  
8:20 a.m.

9:00 a.m.  
9:30 a.m. Grand Foyer (2<sup>nd</sup> Floor)  
9:45 a.m.  
10:20 a.m.  
10:30 a.m. Galleon I

Hilton Crystal Ballroom  
Grand Ballroom  
Galleon II & III

12:00 p.m. **Exhibit Hall B**  
1:00 p.m. Galleon II & III

Galleon I  
Grand Ballroom  
2:30 p.m. Grand Foyer (2<sup>nd</sup> Floor)  
3:00 p.m. Galleon II & III

Yacht  
Galleon I  
Grand Ballroom

4:30 p.m. Exhibit Hall A  
6:00 p.m.

### General Session (8:00 a.m. – 10:20 a.m.)

General Registration/Check-in  
*Greetings from the International Space Station*  
– P Whitson  
*Welcome* – J Charles  
*Remarks from HQ* – C Kundrot  
**Plenary: First Crewed Deep Space Missions since 1972**  
– P Troutman and J Crusan  
**Plenary: Twins and One Year Mission** – J Charles  
**COFFEE BREAK**  
**Plenary: International Plenary** – Partner Agencies  
**BREAK**  
Exploration Medical Capability: Element Overview & Goals  
Occupant Protection and Dynamic Loads  
One Year Mission Results  
The 28th Annual Space Radiation IWS: Welcome and Special Topics  
**LUNCH**  
In-Flight Central Nervous System 1: Keeping things separate, cleaning house, and remembering that every rat and person is special  
Exploration Medical Capability Systems Engineering  
Extravehicular Activity Physiology  
**COFFEE BREAK**  
In-Flight Central Nervous System 2: Paying attention, late nights, and using memory banks with fewer branches  
Advanced Food Technology  
Exploration Medical Capability Operational Research  
HRP Chief Scientist's Office: Conducting Research to Enable Deep Space Exploration  
Poster Session A; Cash Bar Reception  
**Adjourn**

### Tuesday, January 24

7:00 a.m. Pre-function (1<sup>st</sup> floor)  
8:00 a.m. **Grand Ballroom**

General Registration/Check-in  
**Plenary: Results from ISS Research** – J Stuster, D Dinges, S Thaxton

9:30 a.m.	Grand Foyer (2 <sup>nd</sup> floor)	<b>COFFEE BREAK</b>
9:45 a.m.	Yacht	Exploration Exercise Device Development and Supporting Analyses
	Galleon I	Exploration Medical Capability Information Resources: Integrated Medical Model
	Hilton Crystal Ballroom	Human Exploration Research Analog Panel
	Grand Ballroom	Immunology and Microbiology
	Galleon II & III	In-Flight Central Nervous System 3: Accumulating bad connections and what they're made of
11:15 a.m.	Exhibit Hall B	<b>Obtain LUNCH</b>
12:00 p.m.	<b>Grand Ballroom</b>	<b>Lunch Plenary:</b> <i>Transforming Medical Research and Care with Data, Analytics and Technology</i> - L Chin
1:00 p.m.	Galleon II & III	Approaches to Human Health Risk Assessment
	Yacht	Biomechanical and Musculoskeletal Computational Modeling
	Hilton Crystal Ballroom	Brain and Behavior Changes under Spaceflight Stressors
	Galleon I	Exploration Medical Capability Information Resources
	Grand Ballroom	Spaceflight-Induced Cardiovascular Health Risk Assessment
2:30 p.m.	Grand Foyer (2nd floor)	<b>COFFEE BREAK</b>
3:00 p.m.	Galleon I	Exploration Medical Capability Closed Session I
	Hilton Crystal Ballroom	Markers for Individualizing Countermeasures in Exploration
	Grand Ballroom	Sensorimotor Flight and Ground Studies
	Galleon II & III	Simulating the Space Environment – The Good, the Bad, and the Ugly
	Yacht	Visual Impairment and Intracranial Pressure
4:30 p.m.	Exhibit Hall A	Computational Modeling
6:00 p.m.		Poster Session B; Cash Bar Reception
		<b>Adjourn</b>

### Wednesday, January 25

7:00 a.m.	Pre-function (1 <sup>st</sup> floor)	General Registration/Check-in
8:00 a.m.	Galleon I	Exploration Medical Capability Technology Development
	Galleon II & III	Exploration Monitoring Tools I
	Hilton Crystal Ballroom	Physics I
	Yacht	Radiation Effects on Affairs of the Heart I
	Grand Ballroom	Visual Impairment and Intracranial Pressure Update
	Helm	EVA Forum
9:30 a.m.	Grand Foyer (2 <sup>nd</sup> floor)	<b>COFFEE BREAK</b>
9:45 a.m.	Galleon I	Exploration Medical Capability Collaborators
	Galleon II & III	Exploration Monitoring Tools II
	Hilton Crystal Ballroom	Physics II
	Yacht	Radiation Effects on Affairs of the Heart II
	Grand Ballroom	Spaceflight and the Brain
11:15 a.m.	Exhibit Hall B	<b>Obtain LUNCH</b>

<b>12:00 p.m.</b>	<b>Grand Ballroom</b>	<b>Lunch Plenary: Measures in Human-Robot Interaction (HRI) for Disaster Robotics</b> – R Murphy
1:00 p.m.	Clipper Galleon II & III	NSBRI Career Development & Outreach Luncheon
	Galleon I	Communication: The Omics of Sports & Space: How Genomics is Transforming Both Fields
	Yacht Grand Ballroom	Exploration Medical Capability Technology
2:30 p.m.	Hilton Crystal Ballroom	Development: Imaging Technologies
3:00 p.m.	Grand Foyer (2nd floor) Galleon II & III	Space Radiation Carcinogenesis I
	Grand Ballroom	Visual Impairment and Intracranial Pressure Analogs and Countermeasures
	Yacht Hilton Crystal Ballroom	NSRL Annual Review (closed)
4:30 p.m.		<b>COFFEE BREAK</b>
<b>5:00 p.m.</b>	<b>Pre-function (1st floor)</b>	Characterizing Behavioral Changes in Isolation and Confinement
<b>6:45 p.m.</b>	<b>Grand Ballroom</b>	Monitoring Ocular and Brain Changes to Understand Visual Impairment and Intracranial Pressure
		Space Radiation Carcinogenesis II
		NSRL Annual Review (closed)
		<b>BREAK</b>
		<b>Cash Bar Happy Hour</b>
		<b>2017 HRP Awards Banquet</b>
		<i>HRP Awards</i> – W Paloski
		<i>Dr. David Watson Poster Competition Awards</i> – G Scott
		<i>NSBRI Pioneer Award</i> – J Sutton
		<b>Keynote: The Sports Gene: Inside the Science of Extraordinary Athletic Performance</b>
		David Epstein; <i>Author of New York Times Bestseller, The Sports Gene</i>
9:00 p.m.		<b>Adjourn</b>

#### Thursday, January 26

7:00 a.m.	Pre-function (1 <sup>st</sup> floor)	General Registration/Check-in
8:00 a.m.	Yacht	Exercise - Bedrest and International Space Station
	Galleon I	Exploration Medical Capability Closed Session II
	Galleon II & III	Space Radiation Carcinogenesis III
	Hilton Crystal Ballroom	Team, Training, and Performance Metrics
	Grand Ballroom	Twins I
9:30 a.m.	Grand Foyer (2 <sup>nd</sup> floor)	<b>COFFEE BREAK</b>
9:45 a.m.	Yacht	Exercise Countermeasures and Technology
	Galleon I	How to Conduct A Better Flight Study
	Galleon II & III	Inter-Agency Approaches to Radioprotection
	Hilton Crystal Ballroom	Tools and Methods for Habitability
	Grand Ballroom	Twins II
11:15 a.m.	Exhibit Hall B	<b>Obtain LUNCH</b>
<b>12:00 p.m.</b>	<b>Grand Ballroom</b>	<b>Lunch Plenary: The Hubble Space Telescope: 26 Years of Incredible Cosmic Discovery</b> – J Wiseman
1:00 p.m.	Galleon I	Analogs – The Next Best Thing to Being There
	Hilton Crystal Ballroom	Countermeasures for Exploration

	Yacht	How We Do Business
	Galleon II & III	Inter-Agency Discussion on Space Radiation
	Grand Ballroom	Preserving Skeletal Health of Astronauts During Long-Duration Spaceflight
2:30 p.m.	Grand Foyer (2nd floor)	<b>COFFEE BREAK</b>
<b>3:00 p.m.</b>	<b>Grand Ballroom</b>	<b><i>Plenary: Astronaut Panel</i></b> – K Rubins
4:30 p.m.		<i>Closing Comments</i> – J Charles

Monday, January 23, 2017

Exploration Medical Capability: Element Overview and Goals

10:30 AM

Galleon I

**Chairs:** Baraquiel Reyna and Ronak Shah

- 10:30 AM Canga M.  
[ExMC Element Management Approach - Canga \[#17118\]](#)  
The ExMC Element is engaged in medical risk mitigation targeting the proving ground vehicle and Mars missions.
- 10:45 AM Antonsen E.  
[ExMC Element Content and Context – Antonsen \[#17119\]](#)  
The Exploration Medical Capabilities (ExMC) Element is responsible for risk mitigation for several risks within the Human Research Program.
- 11:00 AM Hailey M.  
[ExMC Exploration Clinician Working Group - Hailey \[#17120\]](#)  
The Exploration Clinician Working Group is responsible for supporting the Element Scientist with technical guidance and direction for the element.
- 11:15 AM McCoy T.  
[Risk of Adverse Health & Performance Effects of Celestial Dust Exposure \[#17121\]](#)  
With the culmination of the Lunar Airborne Dust Toxicity Assessment Group (LADTAG) efforts, a permissible exposure limit (PEL) was established for lunar dust in 2014, and later translated into a NASA Standard 3001 Volume 2 standard.
- 11:30 AM Sibonga J.  
[BONE FRACTURE RESEARCH PLAN: ASSESSING THE PROBABILITY OF OVERLOADING BONES \[#17122\]](#)  
The presentation will highlight how the research plan under Osteoporosis can inform the probabilistic assessment and the clinical management of fractures by Exploration Medical Capabilities.
- 11:45 AM Discussion [\[#17123\]](#)
- 12:00 PM Break [\[#17124\]](#)

Monday, January 23, 2017

Occupant Protection and Dynamic Loads

10:30 AM

Hilton Crystal Ballroom

**Chairs:** Jeffrey Somers and Jessica Wells

- 10:30 AM Somers J. Newby N. Putnam J. Wells J.  
[\*ASSESSING THE RISK OF CREW INJURY DUE TO DYNAMIC LOADS DURING SPACEFLIGHT\* \[#17218\]](#)  
Overview of the Occupant Protection Risk and Research Plan
- 10:45 AM Wells J. Somers J. Newby N. Putnam J.  
[\*Anthropometric Test Device Injury Metric Development\* \[#17219\]](#)  
This study uses existing PMHS test data and match-paired ATD test data to generate injury risk curves for two types of ATDs for spacecraft dynamic environments.
- 11:00 AM Putnam J. Somers J. Wells J. Newby N.  
[\*ASSESSING THE SENSITIVITY AND EXTENSIBILITY OF ANTHROPOMORPHIC TEST DEVICE RESPONSES IN SPACEFLIGHT CONDITIONS\* \[#17220\]](#)  
This study evaluates the sensitivity of the prediction of occupant injury risk by anthropomorphic test devices to a variety of spaceflight vehicle configurations and loading conditions.
- 11:15 AM Somers J. Newby N. Putnam J. Baldwin M. Wells J. Lawrence C. Currie-Gregg N.  
[\*SUITED AND UNSUITED HYBRID III IMPACT TESTING AND FINITE ELEMENT MODEL CHARACTERIZATION\* \[#17221\]](#)  
Evaluation of the Hybrid III anthropomorphic test devices and associated finite element models in spaceflight loading environments.
- 11:30 AM Weaver A. Stitzel J.  
[\*IMAGING AND MODELING TECHNIQUES FOR ASSESSING DYNAMIC VERTEBRAL STRENGTH AND INJURY RISK IN LONG-DURATION SPACEFLIGHT\* \[#17222\]](#)  
Prolonged exposure to microgravity during long-duration spaceflight can degrade the musculoskeletal system, increasing the risk of structural failure of these tissues when they experience dynamic loads.
- 11:45 AM Fujimoto K. Wade E. Sakai S. Izumi S. Numajiri H. Tanabe J.  
[\*DEVELOPMENT OF SPACESHIP CREW INJURY RISK ANALYSIS METHOD FOR IMPACT LOAD\* \[#17223\]](#)  
In order to realize human space missions to moon, mars and beyond, and to establish easy-to-access to space such as space travel, further improvement of the crew safety is essential.
- 12:00 PM Break [#17224]



**Monday, January 23, 2017**

**One Year Mission Results**

**10:30 AM**

**Grand Ballroom**

**Chairs: John Charles and Peter Norsk**

- 10:30 AM Bloomberg J. Batson C. Buxton R. Feiveson A. Kofman I. Laurie S. Lee S. Miller C. Mulavara A. Peters B. May-Phillips T. Ploutz-Snyder L. Reschke M. Ryder J. Stenger M. Taylor L. Wood S.  
[\*THE FUNCTIONAL TASK TEST: RESULTS FROM THE ONE-YEAR MISSION\* \[#17225\]](#)  
Results from the Functional Task Test (FTT) study from the one-year mission will be presented at the meeting, and a comparison will be made with data previously obtained using the same protocol on astronauts tested before and after 6 months in space.
- 10:45 AM Reschke M. Kozlovskaya I. Kofman I. Tomilovskaya E. Cerisano J. Rosenberg M. Stenger M. Lee S. Bloomberg J. Laurie S. Rukavishnikov I. Fomina E. Wood S. Mulavara A. Feiveson A. Fisher E. Phillips T. Ribeiro C. Gadd N. Taylor L. Peters B.  
[\*FIELD TEST: RESULTS FROM THE ONE YEAR MISSION\* \[#17226\]](#)  
Summary of the preliminary results of the data collected for the Field Test on the two one year station subjects.
- 11:00 AM Holden K. Sandor A. Cross E. Greene M.  
[\*EFFECTS OF LONG-DURATION MICROGRAVITY ON FINE MOTOR SKILLS\* \[#17227\]](#)  
  
This abstract describes the results to date from the Fine Motor Skills study currently in progress on ISS, including 1-Year Mission and standard duration crew subjects.
- 11:15 AM Barger L. Sullivan J. Ronda J. Czeisler C.  
[\*SLEEP-WAKE ACTIGRAPHY AND LIGHT EXPOSURE ON A ONE-YEAR INTERNATIONAL SPACE STATION MISSION\* \[#17228\]](#)  
Sleep and circadian rhythms were investigated in crewmembers aboard a one-years ISS mission.
- 11:30 AM Seidler R. Mulavara A. Koppelmans V. Kofman I. Cassady K. Yuan P. DeDios Y. Gadd N. Riascos R. Wood S. Bloomberg J.  
[\*EFFECTS OF ONE YEAR OF SPACEFLIGHT ON NEUROCOGNITIVE FUNCTION\* \[#17229\]](#)  
We will present data on the effects of a one year spaceflight mission on brain structure and function and sensorimotor behavior.
- 11:45 AM Discussion [#17230]
- 12:00 PM Break [#17231]

Monday, January 23, 2017

The 28th Annual Space Radiation IWS: Welcome and Special Topics

10:30 AM

Galleon II & III

**Chairs:** Lisa Simonsen and Greg Nelson

10:30 AM The 28th Annual Space Radiation IWS – Welcome and Special Topics **[#17561]**

10:45 AM Bioce J.  
*[NCRP looks at potential CNS effects from Space Radiation](#)* **[#17562]**  
PHASE I: OVERVIEW; an ongoing committee is preparing a more detailed Phase II report. NCRP is also conducting epidemiological studies of dementia in radiation workers (terrestrial) who received high-LET radiation dose (alpha particles) to brain.

11:05 AM Herr D.  
*[THE ADVERSE OUTCOME PATHWAY \(AOP\) FRAMEWORK: A FRAMEWORK FOR ORGANIZING BIOLOGICAL KNOWLEDGE LEADING TO HEALTH RISKS](#)* **[#17563]**  
An Adverse Outcome Pathway (AOP) represents the organization of current and newly acquired knowledge of biological pathways.

11:25 AM Goodhead D.  
*[Track Structure, RBE and Quality Factor](#)* **[#17564]**  
The track structure of ionizing radiations is the radiation ‘quality’ property that determines their relative biological effectiveness (RBE) for a specified biological system and effect level.

11:55 AM Discussion **[#17565]**

12:00 PM Break **[#17565]**

Monday, January 23, 2017

**In-Flight Central Nervous System 1: Keeping things separate, cleaning house, and remembering that every rat and person is special**

1:00 PM

Galleon II & III

**Chair: Ameilia Eisch**

1:00 PM 2016 CNS Activities and Highlights for the Space Radiation Element **[#17170]**

1:10 PM Britten R. Deutsch S.  
*SIMILARITIES AND DISPARITIES BETWEEN THE NEUROCOGNITIVE/BEHAVIORAL ASSESSMENTS MADE ON ASTRONAUTS AND IN GROUND-BASED RODENT STUDIES ON THE IMPACT OF SPACE RADIATION. [#17171]*  
An overview of the work conducted under NASA contract NNJ17HP01P.

1:30 PM Rabin B. Carrihill-Knoll K. Barton K. Miller M. Shukitt-Hale B.  
*AGE AS A FACTOR IN THE RESPONSIVENESS OF THE ORGANISM TO THE DISRUPTION OF COGNITIVE PERFORMANCE BY EXPOSURE TO HZE PARTICLES DIFFERING IN LET [#17172]*  
Threshold dose for the disruption of cognitive performance can vary as a function of the age of the subject and the LET of the specific particle.

1:50 PM Whoolery C. Yun S. Lucero M. Walker A. Ito N. Redfield R. Richardson D. Reynolds R. Palchik G. Mukherjee S. Rivera P. Chen B. Birnbaum S. Stowe A. Eisch A.  
*Unexpected enhancement in pattern separation and operant learning following space radiation exposure in mature mice: cellular and translational underpinnings [#17173]*  
Mice irradiated with HZE particles at an age equivalent to the average astronaut improves both hippocampal-based pattern separation and operant learning. This improved cognition was seen with both shock- and appetitive/reward-based behavioral paradigms.

2:05 PM Chang P. Shaler T. Lin H. Bakke J. Chen S.  
*PARTICLE RADIATION-INDUCED DYSREGULATION OF PROTEIN HOMEOSTASIS IN THE BRAIN [#17174]*  
The goal of our project is to evaluate the impact of particle-radiation induced alterations in CNS ubiquitin pool dynamics and other overall proteomics changes using quantitative proteomics methods to assess potential CNS risks after space radiation exposures.

2:20 PM Discussion **[#17175]**

2:30 PM Break **[#17176]**

Monday, January 23, 2017

Exploration Medical Capability Systems Engineering

1:00 PM

Galleon I

**Chairs:** Jeff Reilly and Jennifer Mindock

- 1:00 PM Mindock J. Reilly J.  
[\*Exploration Medical Capability System Engineering Introduction and Vision\* \[#17097\]](#)  
ExMC is applying systems engineering principles and practices to accomplish its exploration mission and vehicle technical integration goals.
- 1:15 PM Reilly J. Mindock J. Hanson A. McGuire K. Reyna B.  
[\*USING A MODEL-BASED SYSTEMS ENGINEERING APPROACH FOR EXPLORATION MEDICAL SYSTEM DEVELOPMENT\* \[#17098\]](#)  
The Exploration Medical Capabilities Element is using a Model-Based Systems Engineering approach for the development of the exploration medical system.
- 1:30 PM Hailey RN M. Reyes, MD, MPH D. Urbina M. Rubin D. Antonsen MD PhD E.  
[\*DEFINING MEDICAL LEVELS OF CARE FOR EXPLORATION MISSIONS\* \[#17099\]](#)  
The five levels of care required by NASA STD 3001 Vol 1 are interpreted in the context of the Mars Medical Concept of Operations developed by the Exploration Medical Capability (ExMC) of the Human Research Program.
- 1:45 PM Urbina M. Rubin D. Hailey M. Reyes D. Antonsen E.  
[\*Medical System Concept of Operations for Mars Exploration Missions\* \[#17100\]](#)  
The Medical System Concept of Operations for Mars Exploration Missions illustrates how a future NASA Mars program could ensure appropriate medical care for the crew of this highly autonomous mission.
- 2:00 PM Mindock J. McGuire K. Middour C. Cerro J. Burba T. Hanson A. Reilly J.  
[\*Exploration Medical System Technical Development\* \[#17101\]](#)  
The work described in this talk supports the exploration medical community-wide understanding of the functional exploration needs to be met by the medical system, the subsequent development of medical system requirements, and the system maturation approach.
- 2:15 PM Othon B.  
[\*Advancing Technologies for Human Exploration of Space Through Integration and Ground Test\* \[#17072\]](#)  
Mission risks and technology gaps for human spaceflight can be partially addressed through the collaboration of technical and human factors disciplines in the context of an integrated ground test environment.
- 2:30 PM Break [#17103]

Monday, January 23, 2017

Extravehicular Activity Physiology

1:00 PM

Grand Ballroom

**Chairs:** Jason Norcross and Andrew Abercromby

1:00 PM Integrated EVA Human Research Plan [#17135]

1:20 PM Norcross J. Jarvis S. Bekdash O. Cupples J. Abercromby A.  
[EVA HUMAN HEALTH AND PERFORMANCE BENCHMARKING MICROGRAVITY PROTOCOL \[#17136\]](#)  
The development and initial testing of a microgravity focused protocol to help develop a set of EVA health and human performance standard measure benchmarks will be discussed.

1:40 PM Jarvis S. Abercromby A. Norcross J.  
[Subjective Suit Fit Assessment \[#17137\]](#)  
A formalized subjective suit fit assessment will help to capture feedback on the quality of spacesuit fit in a more consistent and quantifiable way in order to better understand the baseline degree of fit each subject has for a given suited exposure.

1:55 PM Bekdash O. Norcross J. Meginnis I. Fricker J. Abercomby A.  
[DEVELOPMENT OF A SPACESUIT CARBON DIOXIDE WASHOUT MEASUREMENT METHODOLOGY \[#17138\]](#)  
Characterization of equipment and methods used during CO2 washout testing of spacesuits.

2:15 PM Conkin J. Wessel, III J. Norcross J. Bekdash O. Abercromby A. Koslovsky M. Gernhardt M.  
[HEMOGLOBIN O2 SATURATION WITH MILD HYPOXIA AND MICROGRAVITY: PRELIMINARY \[#17139\]](#)  
Microgravity exposure does not reduce hemoglobin oxygen saturation beyond what is measured under mild hypoxia in normal gravity.

2:30 PM Break [#17140]



Monday, January 23, 2017

**In-Flight Central Nervous System 2: Paying attention, late nights, and using memory banks with fewer branches**

**3:00 PM**

**Galleon II & III**

**Chair: Catherine Davis**

- 3:00 PM Limoli C. Parihar V. Maroso M. Rudbeck E. Baulch J. Acharya M. Vlkolinsky R. Nelson G. Britten R. Soltesz I.  
*Mechanisms of long-term cognitive impairment caused by exposure to the space radiation environment* [#17177]  
Our collective data indicate that multiple mechanisms converge to impact charged particle induced disruptions to cognition
- 3:20 PM Britten R. Wellman L. Sanford L.  
*Hadron-induced impairment of Executive Function: the exacerbating impact of sleep deprivation* [#17178]  
The impact that sleep perturbation has on the severity of HZE-induced impairment of ATSET performance will be presented
- 3:40 PM Davis C. Mange A. Guida P. Hienz R.  
*THE EFFECTS OF PROTON OR OXYGEN (16O) EXPOSURE ON SUSTAINED ATTENTION, CORE BODY TEMPERATURE, AND ACTIVITY LEVELS IN RATS* [#17179]  
Proton or oxygen exposure result in deficits in accuracy and increases in premature responding on the rPVT.
- 4:00 PM Raber J. Rosi S. Stewart B. Riparip L. Jopson T. Turker M. Impey S.  
*Cognitive injury, network stability, and epigenetic change following exposure to high and low let irradiation* [#17180]  
Proton irradiation impairs cognitive function at the 2- and 20-week time points and the proton radiation-induced cognitive injury is associated with changes in the distribution of cytosine methylation (5mC) and hydroxymethylation (5hmC) of cytosine in the hippocampus.
- 4:20 PM Discussion [#17181]
- 4:30 PM Break [#17182]

Monday, January 23, 2017

Advanced Food Technology

3:00 PM

Yacht

Chair: Grace Douglas

- 3:00 PM Barrett A. Froio D. Richardson M.  
*Stabilized Foods for Use in Extended Spaceflight: Preservation of Shelf-Life, Nutrient Content and Acceptability. [#17001]*  
Long term vitamin stability and quality are being assessed in model foods and in foods sterilized by advanced processing procedures.
- 3:18 PM Cooper M. Bermudez-Aguirre D. Smith S. Douglas G.  
*THE STABILITY OF BIOACTIVE COMPOUNDS IN SPACEFLIGHT FOODS [#17002]*  
Studying bioactive compounds in spaceflight foods revealed efficacious concentrations of lycopene, lutein, and omega-3 fatty acids in limited food provisions; more provisions and chilled food storage are needed to implement functional food countermeasures for exploration missions.
- 3:36 PM Goulette T. Dixon W. Peleg M. Xiao H.  
*Kinetic modeling of vitamin degradation in spaceflight foods during non-isothermal heat treatments [#17003]*  
Our results validated the potential of our kinetic modeling program in predicting vitamin degradation kinetics in spaceflight foods under different heat treatment conditions.
- 3:54 PM Sirmons T. Douglas G. Barrett A. Richardson M. Williams T.  
*MEAL REPLACEMENT MASS REDUCTION AND INTEGRATION ACCEPTABILITY STUDY [#17004]*  
The purpose of this study was to develop a variety of nutritionally balanced breakfast replacement bars that meet spaceflight nutritional, microbiological, sensorial, and shelf-life requirements, while enabling a 10% savings in food mass.
- 4:12 PM Massa G. Wheeler R. Romeyn M. Hummerick M. Spencer L. Morrow R. Mitchell C. Burgner S. Williams T. Young M. Douglas G.  
*PREPARING FOR VEG-04 AND VEG-05: IMPROVING PICK-AND-EAT FOOD CAPABILITIES FOR THE INTERNATIONAL SPACE STATION [#17005]*  
Researchers from Kennedy Space Center, Johnson Space Center, Purdue University and ORBITEC have teamed up to explore the potential for plant growth and food production on the International Space Station (ISS) and future exploration missions.
- 4:30 PM Break [#17006]

Monday, January 23, 2017

Exploration Medical Capability Operational Research

3:00 PM

Galleon I

**Chairs:** Kerry McGuire and Jeff Reilly

- 3:00 PM Daniels V. Bayuse T. Mulcahy R. McGuire K. Antonsen E.  
[\*THE PATHWAY TO A SAFE AND EFFECTIVE MEDICATION FORMULARY FOR EXPLORATION SPACEFLIGHT\*](#) [#17090]  
This abstract details the research strategy or pathway proposed by the Exploration Medical Capabilities Element that will lead to the availability of safe and effective medications for use during exploration spaceflight missions.
- 3:15 PM Cory W. James G. Mangiaracina K. Lamas A. Moon J.  
[\*Analysis of Degradation of Pharmaceuticals Stored on the International Space Station\*](#) [#17091]  
Medications stored on the ISS were analyzed for degradation and compared to similar medications stored in Johnson Space Center pharmacy.
- 3:30 PM Wotring V. Smith L. Cook K.  
[\*DOSE TRACKER APPLICATION FOR MONITORING CREW MEDICATION USAGE, SYMPTOMS AND ADVERSE EFFECTS DURING MISSIONS\*](#) [#17092]  
The Dose Tracker study is in progress on the ground and on the ISS, collecting near-real time medication use data directly from crew volunteers for analysis of flight - ground differences in medication usage or effects.
- 3:45 PM Toscano B. Cowings P. Sullivan P. Martin A. Roy J. Krihak M. Winther S. Hanson A.  
[\*Wearable Biosensor Monitor to Support Autonomous Crew Health and Readiness to Perform\*](#) [#17093]  
A technology demonstration of a wearable biosensor monitor used by crew during HERA Campaign 3 missions. The presentation will focus on hardware and software performance in the analog environment, crew usability and comfort, and development of a next generation wireless biosensor system.
- 4:00 PM Farqharon S. Brouillette C.  
[\*ANALYSIS OF ISS DRUG DEGRADATION BY RAMAN SPECTROSCOPY\*](#) [#17094]  
Recent studies have shown that some of the medications currently used by astronauts may degrade more rapidly in space, losing their potency well before their expiration dates.
- 4:15 PM Discussion [#17095]
- 4:30 PM Break [#17096]

**Monday, January 23, 2017**

**HRP Chief Scientist's Office: Conducting Research to Enable Deep Space Exploration**

**3:00 PM**

**Grand Ballroom**

**Chair: John Charles**

3:00 PM Cromwell R. Charles J. Fogarty J. Vega L. Haven C. McFather J. Savelev I.  
[\*HRP Chief Scientist's Office: Conducting Research to Enable Deep Space Exploration\*](#)  
[\*\*\[#17155\]\*\*](#)  
The HRP Chief Scientist's Office sets the scientific agenda for the Human Research Program. As NASA plans for deep space exploration, HRP is conducting research to ensure the health of astronauts, and optimize human performance during extended duration missions.

4:30 PM Break

Monday, January 23, 2017

Poster Session A: Advanced Food Technology

4:30 PM

Exhibit Hall A

Sirmons T. Douglas G. Cooper M.

[\*FOOD FORTIFICATION STABILITY STUDY\* \[#17245\]](#)

The purpose of this research is to assess the stability of vitamin supplementation in traditionally processed spaceflight foods.

Wheeler R. Spencer L. Graham T. Stutte G. Massa G.

[\*Space Pomology: Dwarf Plums for Fresh Food Production\* \[#17246\]](#)

Findings from studies on the use of dwarf plums as a candidate crop for fresh food production in space will be presented. The dwarf plums were developed by the USDA and can grow from seed to flower to fruit in less than 1 year on small plants.

Douglas G. Crucian B. Zwart S. Young M. Kloeris V. Smith S. Lorenzi H.

[\*THE INTEGRATED IMPACT OF DIET ON HUMAN IMMUNE RESPONSE, THE GUT MICROBIOTA, AND NUTRITIONAL STATUS DURING ADAPTATION TO A SPACEFLIGHT ANALOG\* \[#17247\]](#)

Spaceflight impacts human physiology, including well documented immune system dysregulation. Diet, immune function, and the microbiome are interlinked, but diet is the only one of these factors that we have the ability to easily, and significantly, alter on Earth or during flight.



**Monday, January 23, 2017**

**Poster Session A: Artificial Gravity Project**

**4:30 PM**

**Exhibit Hall A**

Gruber J. Seyedmadani K. Vincent G. Reed B. Gruber J. Clark T.

***A NOVEL LINEAR SLED “HYBRID” ARTIFICIAL GRAVITY COUNTERMEASURE FOR MICROGRAVITY-INDUCED PHYSIOLOGICAL DECONDITIONING [#17248]***

The linear sled- hybrid artificial gravity system is an innovative method to mitigate several physiological deconditioning due to microgravity, this group is investigating unanticipated side effects such as motion sickness of this technology.

Bretl K. McCusker A. Dixon J. Clark T.

***HUMAN ADAPTATION TO THE CORIOLIS CROSS-COUPLED ILLUSION FOR ARTIFICIAL GRAVITY [#17249]***

This research aims to reduce the intensity of CC illusions during short-radius centrifugation by increasing an individual's tolerance of higher spin rates through repeated exposure (i.e., an adaptation training protocol).

Monday, January 23, 2017

Poster Session A: Biomechanical and Musculoskeletal Computational Modeling

4:30 PM

Exhibit Hall A

Jagodnik K. Thompson W. Gallo C. DeWitt J. Funk J. Funk N. Perusek G. Sheehan C. Lewandowski B.

*Biomechanical Modeling of the Deadlift Exercise to Improve the Efficacy of Resistive Exercise Microgravity Countermeasures* [#17250]

The deadlift exercise is modeled using the OpenSim software platform to study the characteristics of this exercise performed under different loading conditions while controlling for load, cadence and stance width, to inform the design of prototype resistive exercise devices.

Blemker S. Peirce-Cottler S. Fregly B.

*OVERVIEW OF MUSCLE ADAPTATION IN SPACE-FLIGHT SIMULATOR* [#17251]

This presentation will provide an overview of the Muscle Adaptation in Space Flight Simulator and describe our recent modeling developments that will be integrated into the simulation framework.

Wermer C. Lewandowski B. Pennline J.

*IMPLEMENTATION AND INTEGRATION OF A FINITE ELEMENT MODEL INTO THE BONE REMODELING MODEL TO CHARACTERIZE SKELETAL LOADING* [#17252]

NASA's Digital Astronaut Project is developing a bone physiology model to predict changes in bone mineral density over the course of a space mission.

Monday, January 23, 2017

Poster Session A: Bone

4:30 PM

Exhibit Hall A

Hargens A. Macias B. Masuda K. Ferguson A. Morioka K. Lotz J.  
*Spinal Structure and Function after 90 Days Long-Duration Simulated Space Flight and Recovery* [#17253]

We will compare morphology, biochemistry, and kinematics of spines (including the vertebrae, intervertebral discs, spinal cords and spinal muscles) of 90 day, hind-limb suspended and control rats.

Rossi M. Charvat J. Sibonga J. Sieker J.  
*Characterizing fractures across the Astronaut Corps: Preliminary findings from population-level analysis* [#17254]

Preliminary descriptive findings from a population-level review of the crewmembers with at least one fracture event.

Pendleton M. Alwood J. Sibonga J. O'Connell G. Keaveny T.  
*Effect of Ionizing Radiation on Fatigue Mechanics of Mouse Vertebra* [#17255]  
Determining the effects of ionizing radiation at space-relevant doses on the cyclic mechanical properties of bone and the underlying molecular mechanisms using a mouse model.

Globus R. Alwood J. Tahimic C. Schreurs A. Shirazi-Fard Y. Terada M. Zaragoza J. Truong T. Bruns K. Castillo A. Limoli C. Delp M.  
*Simulated space radiation and weightlessness: vascular-bone coupling mechanisms to preserve skeletal health* [#17256]  
Acutely, irradiation and simulate weightlessness cause greater microvessel deficits when combined; later, HZE but not unloading, causes persistent, adverse consequences for bone and vessel function, possibly due to long-term redox sensitive pathways and oxidative injury.

Shirazi Y. Rael V. Torres S. Bryant S. Tahimic C. Globus R.  
*GENE EXPRESSION AND STRUCTURAL SKELETAL RESPONSE TO LONG-DURATION SIMULATED MICROGRAVITY IN RATS* [#17257]  
A better understanding of the molecular mechanisms and extent of skeletal risk posed by long duration weightlessness will improve development of countermeasures for future, exploration-class missions.

Skulan J. Smith S. Anbar A. Gordon G. Romaniello S. Zwart S.  
*CALCIUM ISOTOPES MEASURE CHANGE IN BONE MINERAL BALANCE DURING SPACELIFHT* [#17258]  
Isotopic analysis of calcium in urine collected from ISS crewmembers in spaceflight show changes in bone mineral balance associated with different bone loss countermeasures, and reveal considerable variations in response between crewmembers.

Bouxein M. Mokhtarzadeh H. Burkhart K. Allaire B. Lu D. Demissie S. Kopperdahl D. Keaveny T. Samuelson E. Kiel D. Anderson D.  
*Use of patient-specific musculoskeletal models of the thoracolumbar spine and QCT-based finite element analysis to predict vertebral fracture risk* [#17448]  
Vertebral fractures (VFX) are common, affecting 15-35% of the population >50 yrs. Identification of those at highest risk is critical to optimize prevention of VFX.

Judex S. Varshney M. Sankaran J.

*ESR1 and ESR2 Deletion Play Opposing Roles During Unloading Induced Suppression of Bone Formation and Bone Loss* [#17259]

Estrogen receptors 1 and 2 are important modulators of bone health and, here, were found to have opposite effects on bone's propensity to lose tissue mass during unloading

Bokhari R. Metzger C. Allen M. Bloomfield S.

*EXERCISE BENEFITS DURING HINDLIMB UNLOADING EXTEND BEYOND WEIGHTBEARING ALONE* [#17260]

Minimal amounts of weight bearing can mitigate hindlimb unloading-induced losses in bone mass, micro-architecture and altered body composition in adult female mice; however, the addition of active exercise improves these measures in hindlimb unloaded animals beyond weight bearing alone.

Lenfest S. Kosniewski J. Looper A. Brezicha J. Metzger C. Black J. Bloomfield S. Hogan H.

*INITIAL RESULTS FOR A NEW POSITIVE REINFORCEMENT VOLUNTARY JUMPING EXERCISE IN RATS SHOW ENHANCED BONE PARAMETERS* [#17261]

Histomorphometry of the proximal tibia metaphysis and in vivo pQCT results show that a new positive reinforcement voluntary jumping exercise protocol administered for 28 days prior to 28 days of hindlimb unloading protects from unloading associated bone loss in rats.

Metzger C. Anderson A. Bloomfield S.

*SEX-SPECIFIC DIFFERENCES IN BONE LOSS AND SCLEROSTIN PREVALENCE IN RODENT HINDLIMB UNLOADING* [#17262]

Comparison of bone measures and sclerostin osteocyte prevalence in 14 days of hindlimb unloading in male and female rodents.

Alwood J. Scott R. Nalavadi M. Anand S. Shirazi-Fard Y.

*ZOLEDRONATE PREVENTS SIMULATED WEIGHTLESSNESS-INDUCED BONE LOSS IN THE CANCELLOUS COMPARTMENT WHILE BLUNTING THE EFFICACY OF A MECHANICAL LOADING COUNTERMEASURE* [#17263]

Does the combination of an anti-resorptive and high-force exercise during weightlessness have negative effects on bone remodeling and strength?

Elizondo J. Black J. Brezicha J. Lenfest S. Kosniewski J. Bloomfield S. Allen M. Hogan H.

*EFFECTS OF BISPHOSPHONATE PRE-TREATMENTS ON SUBSEQUENT UNLOADING RESPONSE AT THE TIBIA AND FEMUR IN ADULT RATS* [#17264]

Bisphosphonates administered as a pre-treatment prior to hindlimb unloading mitigate the negative effects of unloading at both the tibia and femur metaphases of adult male rats.

Deymier A. Schwartz A. Thomopoulos S.

*The Effects of Unloading on the Structure and Mechanics of the Enthesis* [#17265]

INTRODUCTION The musculoskeletal system is sensitive to the loading environment. Unloading leads to loss and compromised mechanical properties for bone and tendon.

Monday, January 23, 2017

Poster Session A: Cardiovascular

4:30 PM

Exhibit Hall A

Pathak R. Ghosh S. Zhou D. Boerma M. Hauer-Jensen M.

*The Vitamin E Analog Gamma Tocotrienol (GT3) and Statins Synergistically Up-regulate Endothelial Thrombomodulin (TM): Potential strategy of reducing the risk of cardiovascular complications after long-term space mission* [#17266]

The vitamin E analog, gamma tocotrienol (GT3) and statins synergistically up-regulate endothelial thrombomodulin, which has anti-inflammatory, anti-coagulation, anti-oxidant and radio-protective properties and may provide cardiovascular health benefits for astronauts

Lee S. Laurie S. Macias B. Willig M. Johnson K. Stenger M.

*GRADIENT COMPRESSION GARMENTS AS A COUNTERMEASURE TO POST-SPACEFLIGHT ORTHOSTATIC INTOLERANCE: POTENTIAL INTERACTIONS WITH THE MAXIMUM ABSORBENCY GARMENT* [#17267]

it is unknown whether wearing the GCG over NASA's Maximum Absorbency Garment will interfere with the effectiveness of the GCG or conversely whether the GCG will reduce the fluid absorption capabilities of the MAG.

Tahimic C. Steczina S. Terada M. Shirazi-Fard Y. Schreurs A. Goukassian D. Globus R.  
*RESPONSES OF CARDIAC TISSUE TO SIMULATED WEIGHTLESSNESS* [#17268]

Our current study aims to determine the molecular mechanisms that underlie cardiac changes in response to spaceflight.

Allen N. Soucy K. Keynton R. Soucy P.

*γ-RADIATION ALTERS THE CARDIOVASCULAR EXTRACELLULAR MATRIX* [#17269]

Development of an in-vitro fibroblastic model in order to study the effects of γ radiation exposure on cardiovascular fibroblast-derived ECM.

Taqui S. Lindner J.

*BIOMARKER ASSESSMENT FOR IDENTIFYING HEIGHTENED RISK FOR CARDIOVASCULAR COMPLICATIONS DURING LONG-DURATION SPACE MISSIONS* [#17549]

Our aim is to improve risk assessment for cardiovascular complications to space travel using advanced imaging techniques for coronary structural and microvascular endothelial function, together with "omics" (genomics, lipidomics, and targeted metabolomics)



Monday, January 23, 2017

Poster Session A: Central Nervous System

4:30 PM

Exhibit Hall A

Mao X. Nishiyama N. Haynes K. Gifford P. Campbell-Beachler M. Hartman R. Gridley D. Pecaut M.

*Role of NADPH oxidase as a mediator of oxidative damage to low-dose radiation and hindlimb unloading* [#17270]

Our study suggests NADPH oxidase-derived oxidative stress contributes unloading and radiation-induced deleterious effects on endothelial damage and neurovascular remodeling in the brain

Rabin B. Poulouse S. Miller M. Bielinski D. Kelly M. Carrihill-Knoll K. Patel R. Hawkins E. Heng R. Shukitt-Hale B.

*EFFECTS OF HEAD-ONLY OR WHOLE-BODY EXPOSURE TO VERY LOW DOSES OF 4HE (1000 MeV/n) PARTICLES* [#17271]

Exposing the head only or the whole body body to low doses (0.01 cGy) produces changes in neuronal functioning and disrupts cognitive performance.

Britten R. Peterman S. Dutta S.

*Changes in the neuroproteome associated with HZE-induced impairment of cognition* [#17272]

Study of the impact of various HZE ions on ATSET performance and the concomitant changes in the neuroproteome

Sawtell N. Williams M. Thompson R.

*ACUTE AND LONG TERM OUTCOMES OF SIMULATED DEEP SPACE RADIATION EXPOSURE ON LATENT VIRAL CNS INFECTION AND CNS PATHOLOGY* [#17273]

Acute and long term outcomes of simulated galactic cosmic radiation exposure and latent herpes simplex virus in the nervous system are presented.

Raber J. Patel E. Fallgren C. Weil M.

*Effects of 28Si ion irradiation on behavioral and cognitive performance of Balb/c and C3H mice one month following exposure* [#17274]

To study the role of genetic background in modulating the effects of 28Si ion irradiation on the brain, BALB/c and C3H mice female and male mice and their F2 hybrid progeny were irradiated with 28Si ions and are being tested for behavioral and cognitive performance one month later.

Hienz R. Davis C. DeWeese T. Roma P. Guida P.

*EFFECTS OF ERYTHROPOIETIN (EPO) ON NEUROBEHAVIORAL DYSFUNCTION PRODUCED BY 100 cGY PROTONS (150 MeV/n)* [#17275]

The current work was designed to determine the degree to which individual differences in proton-induced behavioral responses may be mitigated by pre-exposure administration of the vascular growth factor erythropoietin (EPO).

Mange A. Roma P. Guida P. Hienz R. Davis C.

*PROTONS OR OXYGEN IONS (160) IMPAIR RECOGNITION MEMORY FOLLOWING A 24-HR RETENTION INTERVAL IN RATS* [#17276]

Rats exposed to protons or oxygen ions displayed deficits in recognition memory at 30-days post-radiation that were dose- and ion-specific.

Reynolds R. Whoolery C. Walker A. Richardson D. Beddow D. Bulin S. DeCarolis N. Leblanc J. Rivera P. Amaral W. Chen B. Eisch A.  
*Silicon Radiation Exposure Transiently Reduces Proliferation but Persistently Decreases New Neuron Survival in the Mouse Hippocampal Dentate Gyrus* [#17277]

Whole body silicon radiation induces a transient and dose-dependent decrease in hippocampal proliferation and neurogenesis, but a persistent decrease in cell survival. Some of these processes are influenced differently depending upon animal gender.

Liu G. Liu B. Lorello P. McKinney P. Caldarone B. Lemere C.  
*Short- and Long-term Sex-Specific Neurobehavioral Effects of 56-Fe Radiation on WT and AD Mice.* [#17278]

We observed dose-, sex- and genotype-dependent short- and long-term effects of 56Fe particle radiation on neurobehavior in WT and AD Tg mice.

Kopacz K. Liu B. Park M. Wang S. Belanger A. Dubey S. Holton P. Reiser V. Trigg W. DiCarli M. Lemere C.

*SHORT- AND LONG-TERM SEX-SPECIFIC EFFECTS OF 56FE RADIATION IN WT AND AD MICE: MICRO-PET IMAGING OF NEUROINFLAMMATION* [#17279]

We observed dose-, sex- and genotype-dependent short- and long-term effects of 56Fe particle radiation on neuroinflammation by 18F-GE180 microPET imaging in WT and AD Tg mice.

Vlkolinsky R. Rudbeck E. Nelson G.

*Proton and Oxygen Particle Radiation Impacts Electrophysiological Functions in the Rat Hippocampus and Medial Prefrontal Cortex* [#17280]

Proton and oxygen radiation impacts neuronal excitability, excitatory synaptic transmission and plasticity the rat slices of the hippocampus and medial prefrontal cortex in vitro.

Kiffer F. Carr H. Alexander T. Groves T. Anderson J. Wang J. Boerma M. Allen A.  
*Effects of Charged Particle Irradiation on Working Memory in a Murine Model* [#17281]

Charged particle irradiation appears to significantly affect hippocampal-dependent working memory, and synaptic mRNA expression in adult mice.

Baulch J. Baddour A. Kawashita T. Allen B. Syage A. Nguyen T. Yoon N. Giedzinski E. Yu L. Parihar V. Acharya M.

*EPIGENETIC MECHANISMS OF THE CNS RESPONSE TO SPACE RADIATION EXPOSURE* [#17282]

Exposure to high LET radiation causes significant changes in global DNA methylation in the brain that correlate with radiation induced cognitive deficits; these molecular and behavioral changes can be ameliorated by inhibiting DNA methylation.

Musto A. Britten R.

*EXPOSURE TO HZE RADIATION INDUCES SEIZURE SUSCEPTIBILITY IN A RODENT MODEL FOR HUMAN SPACE EXPLORATION* [#17283]

HZE induces seizures susceptibility in a model of human space exploration.

Monday, January 23, 2017

Poster Session A: Exercise

4:30 PM

Exhibit Hall A

Morris T. Stimpson S. Miller R. Barton M. Walker A. Leonard M. Carmichael O. van Someren K. Green D. Zanello S. Harridge S.

***TOTAL BODY SKELETAL MUSCLE MASS: ESTIMATION BY CREATINE (METHYL-D3) DILUTION IN ATHLETES [#17284]***

D3-creatine (D3-cr) is a novel technique recently reported for the estimation of skeletal muscle mass via measurement of total body creatine pool size. The aim of this study was to compare estimates of muscle mass from D3-cr and Magnetic Resonance Imaging (MRI) in an athletic population.

Hwang E. English K. Crowell B. Ryder J.

***Design and Construction of an Indoor Mars Analog Track for the Fitness for Mission Tasks Study [#17285]***

The design and construction of the indoor Mars analog track adds to the fidelity of the Fitness for Mission Tasks (FMT) evaluations that will ultimately facilitate the development of fitness for mission muscle strength standards for ISS and exploration missions.

Laughlin M. Reed J. Layne C. Kozlovskaya I. Koryak Y. Albracht K. Staeudle B. Rittweger J.

***SARCOLAB-3: Myotendinous and Neuromuscular Adaptation to Long-term Spaceflight [#17286]***

Following an integrative approach, SarcoLab-3 will perform a battery of in vivo and in vitro investigations into the causes of muscle weakness from the molecular to whole body level utilizing MARES.

Chien J. Parks M. Siu K.

***Development of a mobile motion capture system for future space exploration [#17287]***

Instead of using expensive and space consuming motion capture system, this study uses portable and daily use smartphone to capture the human movement and this device will be crucial for prevention, diagnosis, and treatment of many musculoskeletal and neurological issues.

Caruso J. Voor M. Jagers J. Bai L.

***Musculoskeletal outcomes to chronic high-speed resistive exercise [#17288]***

Examining musculoskeletal changes to chronic high-speed resistive exercise.

Vu L. Wusk G. Benson E. Newby N. Downs M. Kalogera K. Hanson A.

***VALIDATION OF A CAMERA-FREE INERTIAL SENSOR BASED MOTION CAPTURE SYSTEM [#17289]***

This study compares the performance of an infrared camera based motion capture system and inertial measurement unit based system for tracking kinematics during exercise.

Berg E. Diaz Ariles A.

***EXERCISE IN ALTERED GRAVITY FOR INCREASED HEALTH DURING SPACE EXPLORATION [#17290]***

Researching exercise in altered gravity environments to increase astronauts' health during space exploration.

Ryder J. English K. Buxton R. Crowell B. DeWitt J. Goetchius E. Hwang E. Ploutz-Snyder L.

*Identification of Muscle Fitness Standards for Exploration Mission Tasks* [#17291]

This study will determine the relationships between muscle strength and mission task performance in order to inform the development of new muscle strength standards.

Buxton R. Kalogera K. Hanson A.

*The Evolution of Exercise Hardware on ISS: Past, Present, and Future* [#17292]

The evolution of exercise hardware on ISS has implications for future exercise hardware and operations.

Newby N. Hwang E. Kalogera K. Opperman R. Gilkey K. Hanson A.

*VALIDATION OF THE ENHANCED DIGITAL LOAD SYSTEM FOR USE WITH ARED* [#17293]

Abstract contains results from testing a portable force plate developed to integrate with the Advanced Resistive Exercise Device.

Goetchius E. Crowell B. Ozgur O. Hamilton S. Schlund M. Otto C. Newby N. DeWitt J. Ploutz-Snyder R. Ploutz-Snyder L. Haykowsky M. Scott J.

*POSTURE AND EXERCISE-INDUCED CHANGES IN OCULAR PRESSURE AND VOLUME* [#17294]

Measurement of ocular volume changes with a contact lens sensor provided insight into ocular dynamics during exercise.

Newby N. Wusk G. Trinh T. Scott J. Loerch L. Funk N. Perusek G. Hanson A. Ayton B. Ayton C. Downs M.

*Novel Musculoskeletal Loading System for Small Exercise Devices* [#17295]

This abstract contains test results from a newly developed musculoskeletal loading system that integrates with next generation exploration exercise devices.

Koppelmans V. Pasternak O. Bloomberg J. De Dios Y. Wood S. Riascos R. Reuter-Lorenz P. Kofman I. Mulavara A. Seidler R.

*Intracranial Fluid Redistribution During a Spaceflight Analog* [#17296]

Intracranial Fluid Redistribution During 70 Days Of Head Down Tilt Bed Rest

Ade C. Dziewaltowski A. Alexander A. Caldwell J. Baumfalk D. Didier K. Hammer S. Summerfield S. Barstow T.

*REAL-TIME TRACKING OF EXERCISE INTENSITY DURING SIMULATED MISSION TASKS* [#17297]

The physical demands of exploration mission tasks, like any job, can vary depending on the task and environment.

YU C. Sim K. Rao Z. Lei J. Downs M.

*Ultra-Thin Skin Stamps for Coupled Multi-Parametric Physiological Sensing and Environmental Monitoring* [#17298]

Electronic systems that are highly bendable, stretchable and wearable have received increasing attention in the last couple of years because they enable classes of applications that lie outside those easily addressed with traditional wafer based electronics.

Monday, January 23, 2017

Poster Session A: Extravehicular Activity

4:30 PM

Exhibit Hall A

Conkin J. Abercromby A. Bekdash O. Gernhardt M. Norcross J. Tuxhorn J. Wessel, III J.  
*EXPLORATION ATMOSPHERE HYPOBARIC HYPOXIA CHARACTERIZATION*  
[#17299]

The consequences of mild hypoxia in the proposed exploration atmosphere are quantified with several measurements.

Madden K. Peters B. Deshpande A.

*The Influence of Robotic Grip Augmentation in Reducing Spacesuit Glove-Induced Muscle Fatigue during a Repetitive Gripping Task* [#17300]

This study uses surface electromyography to quantify the influence of robotic grip augmentation in reducing spacesuit glove-induced muscle fatigue during a repetitive gripping task.



Monday, January 23, 2017

Poster Session A: Immunology and Microbiology

4:30 PM

Exhibit Hall A

Narayanan A. Henderson S. Metzger C. Bokhari R. Bloomfield S. Newell-Rogers K. Zawieja D.

*AN INVESTIGATION OF SYSTEMIC VERSUS LOCAL INFLAMMATION IN HINDLIMB UNLOADING ASSOCIATED WITH LYMPHATIC DYSFUNCTION* [#17301]

Simulated microgravity causes regional immune changes associated with lymphatic dysfunction.

Spielmann G. Campbell J. Crucian B. Simpson R. Laughlin M.

*THE IMPACT OF LONG DURATION SPACEFLIGHT ON THE FUNCTION OF B-CELLS AND BIOMARKERS OF INFLAMMATION* [#17302]

Retrospectively assessment of the impact of long duration spaceflight on plasmas and salivary markers of B-cell function.

Kunz H. Simpson R. Wu H. Rithidech K. Pierson D. Mehta S. Stowe R. Nelman-Gonzalez M. Chouker A. Crucian B.

*Functional immune alterations, latent Herpesvirus reactivation, physiological stress and clinical incidence onboard the International Space Station (Functional Immune)* [#17303]

Functional Immune is a recently initiated in-flight investigation that seeks to characterize spaceflight-associated immune dysregulation by examining immune function, viral reactivation, interdisciplinary measures, and self-reported mission stressors and adverse health events.

Cromer W. Zawieja D.

*Hind-limb Unloading Causes Different Changes in the Microbiome of Mice and Rats* [#17304]

We examined the changes in fecal microbiome of rats and mice subjected to 4 weeks of hind-limb unloading to determine if there were notable differences in responses between species and found that there were several differences in magnitude and genus level changes.

Ma L. López Díaz C. Hazal Ayhan D. Di Pietro A.

*Genome evolution and functional adaptation of a cross-kingdom fungal pathogen *Fusarium oxysporum* in responding to spaceflight stresses* [#17305]

This presentation will report the initial results from an ongoing study on experimental evolution involving serial passages of a tomato pathogen through its plants or artificial complete media.

**Monday, January 23, 2017**

**Poster Session A: Nutrition**

**4:30 PM**

**Exhibit Hall A**

Smith S. Heer M. Zwart S.

*Biochemical Profile* [#17306]

A review of the Biochemical profile experiment.

Schreurs A. Globus R. Tahimic C. Baulch J. Halloran B.

*Candidate nutritional countermeasure to mitigate adverse effects of spaceflight* [#17307]

During spaceflight, astronauts are subjected to microgravity as well as radiation, both of which have adverse effects on tissues; for this reason there is a need to identify broad-spectrum countermeasures to protect multiple tissues from both insults.

Monday, January 23, 2017

Poster Session A: Omics

4:30 PM

Exhibit Hall A

Parra M. Jung J. Tran L. Boone T. Schonfeld J. Almeida E.

*Successful Validation of RNA Purification and Quantitative Real-Time PCR Analysis of Gene Expression on the International Space Station* [#17308]

The WetLab-2 system was developed to offer new on-orbit capabilities, specifically RNA sample prep and gene expression analysis using RT-qPCR.

Goukassian D. Kishore R. Hakobyan A. Vangala M. Garikipati V. Khachatryan A. Nersisyan L. Mills P. Zuriaga M. Walsh K. Arakelyan A.

*EFFECT OF SPACE FLIGHT ON ASTROUNATS PLASMA-DERIVED EXOSOMAL miRNA EXPRESSION: IMPLICATIONS FOR BIOMARKER DEVELOPEMT* [#17309]

Better understanding of astronauts blood-derived exosome-mediated alterations in multiple gene and protein pathways in tissues and cells will support predictive biomarker discovery and will inform development of multi-tissue mitigating factors and countermeasures for space missions.

Terada M. Schreurs A. Shiraz-Fard Y. Alwood J. Tahimic C. Sowa M. Globus R.

*Effect of ionizing radiation on murine gene expression in skin and bone* [#17310]

Since cellular defense responses to radiation are shared by a variety of organs, we examined whether radiation-induced gene expression changes in skin may be predictive of the responses of skeletal tissue to radiation exposure.

Ade C. Caldwell J. Sutterfield S. Bemben D.

*OMICS AND BIOCHEMICAL MARKERS OF CARDIOVASCULAR HEALTH: RELATIONSHIP WITH BEDREST AND STANDARD PHYSIOLOGICAL MEASURES* [#17311]

Head-down tilt bedrest (HDBR), an analog of spaceflight exposure, is known to attenuate key physiological functions impacting critical, short-or-long term, mission tasks.

Rana B. Schilling J. Prisk G. Siato R. Fiehn O. Patel H. Sharma K.

*Identification of functional metabolomic alterations during the simulated spaceflight environment* [#17312]

The goal of this study is to identify novel early biomarkers in plasma and urine to detect and monitor the progression of these physiological outcomes due to prolonged microgravity and CO<sub>2</sub> exposure as experienced by crew members on long duration missions.

**Monday, January 23, 2017**

**Poster Session A: Pharmacology**

**4:30 PM**

**Exhibit Hall A**

Kast J. Yu Y. Cook K. Moecker R. Basner M. Barger L. Derendorf H. Wotring V.  
*[RX METABOLISM: INFLIGHT PHARMACOKINETIC AND PHARMACODYNAMIC  
RESPONSES TO MEDICATIONS COMMONLY USED IN SPACEFLIGHT](#)* [\[#17313\]](#)  
An overview of a pharmacokinetic and pharmacodynamic study of medications  
commonly used during spaceflight to be performed on the International Space Station.

Monday, January 23, 2017

Poster Session A: Sensorimotor

4:30 PM

Exhibit Hall A

Stallard R. Kofman I. Cerisano J. Rosenberg M. Reschke M. Welch K.  
*FEATURE EXTRACTION, TRANSFORMATION, AND ALGORITHMIC  
CLASSIFICATION OF ASTRONAUT SENSORIMOTOR PERFORMANCE* [#17314]

An algorithmic approach is taken to differentiate between astronaut sensorimotor performance using sEMG data obtained from the Jump-Down Test.

Wood S. Clément G.  
*EVALUATING OTOLITH FUNCTION DURING SPACEFLIGHT USING VESTIBULAR  
EVOKED MYOGENIC POTENTIALS (VEMP)* [#17315]

This joint NASA/ESA study will assess adaptive changes in otolith function using vestibular-evoked myogenic potentials (VEMPs) during and following long-duration spaceflight.

Goel R. Rosenberg M. De Dios Y. Cohen H. Bloomberg J. Mulavara A.  
*ESTIMATION OF OPTIMUM STIMULUS AMPLITUDE FOR BALANCE TRAINING  
USING ELECTRICAL STIMULATION OF THE VESTIBULAR SYSTEM* [#17316]

This project investigates the level of stochastic vestibular stimulation to be used for sensorimotor adaptability training.

Clark T. Merfeld D.  
*DOES ADAPTATION OF TILT PERCEPTION TO ALTERED GRAVITY RELATE TO  
VESTIBULAR PERCEPTUAL THRESHOLDS?* [#17317]

In a ground-based altered gravity paradigm, we found an individual's vestibular perceptual thresholds tend to correlate with how much adaptation of tilt perception was accomplished.

Bloomberg J. Batson C. Caldwell E. Feiveson A. Kreutzberg G. Miller C. Mulavara A. Oddsson L. Peters B. Ploutz-Snyder L. Reschke M. Ryder J. Taylor L. Wood S.  
*DEVELOPMENT OF AN INTEGRATED SENSORIMOTOR COUNTERMEASURE  
SUITE FOR SPACEFLIGHT OPERATIONS* [#17318]

This presentation will provide an overview of a new study that will develop and test a suite of sensorimotor countermeasures designed to reduce post-landing balance and locomotor dysfunction.

Boyle R. Popova Y. Varelas J.  
*Influence of Duration and Intensity of altered gravity on the vestibular system* [#17319]

Despite the permanence of 1G animals sense exposure to a novel, non-1G, environment and adaptive mechanisms are initiated - in the short term compensation is likely confined to the receptors, the brain or both; for longer exposures structural modifications of the otolith may also result.

Dixon J. Rafii A. Bretl K. Clark T.  
*A GROUND-BASED ANALOG FOR MICROGRAVITY-INDUCED SENSORIMOTOR  
REINTERPRETATION: WHEELCHAIR HEAD IMMOBILIZATION PARADIGM* [#17320]

We propose a novel ground-based analog for microgravity-induced sensorimotor reinterpretations (the wheelchair head immobilization paradigm), which will allow for rigorous assessment of the OTTR and ROTTR hypotheses.

Madansingh S. Lee B. Layne C.

*Sensorimotor Adaptation is Generalized within Individuals Among Manual and Locomotor Tasks* [#17321]

Sensorimotor adaptation performance during a manual task can be predicted from sensorimotor adaptation performance during a locomotor task, within an individual.

Campbell D. Wood S. Reschke M. Clément G.

*Evaluating The Subjective Straight Ahead Before And After Spaceflight* [#17322]

The subjective straight ahead of ISS crewmembers and ground control subjects is measured by performing near and far fixation tasks while being tilted or sinusoidally bounced, conducting horizontal and vertical eye and arm movements in darkness, and by spatial perception and estimations.

Kreutzberg G. Rosenberg M. Peters B. Reschke M.

*VALIDATION OF A MANUALLY OSCILLATING CHAIR FOR IN-THE-FIELD ASSESSMENT OF DYNAMIC VISUAL ACUITY ON CREWMEMBERS WITHIN HOURS OF RETURNING FROM LONG-DURATION SPACEFLIGHT* [#17323]

A manually operated oscillating chair for assessing Dynamic Visual Acuity in the field within a few hours of landing was developed and validated for its ability to reproduce the oscillatory frequency of walking on a treadmill.

Rosenberg M. Kreutzberg G. Peeters B. Reschke M.

*STROBOSCOPIC GOGGLES AS A COUNTERMEASURE FOR DYNAMIC VISUAL ACUITY AND LANDING SICKNESS IN CREWMEMBERS RETURNING FROM LONG-DURATION SPACEFLIGHT* [#17324]

In this study, we simulated the decrement in DVA caused by sensorimotor re-adaptation by using minifying lenses and then testing the efficacy of stroboscopic goggles in preventing retinal slip and improving DVA.

Rosenberg M. Kreutzberg G. Galvan-Garza R. Reschke M. Mulavara A.

*MS NON-PHARMACOLOGICAL COUNTERMEASURE TO DECREASE LANDING SICKNESS AND IMPROVE FUNCTIONAL PERFORMANCE WHILE DISORIENTED* [#17325]

We have taken advantage of the stochastic resonance mechanism as a modulator of neurotransmitters to develop a unique stochastic vestibular stimulation countermeasure system to mitigate motion sickness symptoms and improve functional performance after landing.

Rosenberg M. Reschke M. Cerisano J. Kofman I. Fisher E. Gadd N. May-Phillips T. Lee S. Laurie S. Stenger M. Bloomberg J. Mulavara A. Kozlovskaya I. Tomilovskaya E.

*FIELD TEST: RESULTS OF TANDEM WALK PERFORMANCE AFTER LONG-DURATION SPACEFLIGHT* [#17326]

We will present the results thus far of tandem walk performance during the FT and combine these results with data from the 18 crewmembers who participated in the pilot FT, concentrating on the level of performance and recovery rate.

Mulavara A. Warren E. Despot R. Moroney G. Chastain J. eddies y. Gadd N. Taylor L. Peters B. Allen E. Reschke M. Bloomberg J.

*Evaluation of Galvanic Vestibular Stimulation System* [#17327]

In this study we will employ a commonly used technique of transcutaneous electrical stimulation applied across the vestibular end organs (galvanic vestibular stimulation, GVS) to disrupt vestibular function as a simulation of postflight disturbances.

Monday, January 23, 2017

Poster Session A: Space Radiation Cardiovascular

4:30 PM

Exhibit Hall A

Mao X. Tamako J. Campbell-Beachler M. Stanboul S. Rodriguez D. Nishiyama N. Mohanseenivasan V. Boerma M. Hauer-Jensen M. Nelson G.

*Center for Research on Cardiac and Vascular Effects of Space Radiation (Acute Risk Studies) [#17328]*

Our study showed indications of acute impact of low-dose radiation and spaceflight condition on endothelial cells and immune populations.

Koturbash I. Miousse I. Prior S. Nzabarushimana E. Pathak R. Skinner C. Kutanzi K. Allen A. Raber J. Tackett A. Hauer-Jensen M. Boerma M. Nelson G.

*Densely ionizing radiation affects DNA methylation of selective LINE-1 elements [#17329]*

Sequential exposure to low absorbed mean doses of protons and heavy iron ions leads to altered DNA methylation within selective LINE-1 elements.

Skinner C. Miousse I. Pathak R. Garg S. Melnyk S. Hendrickson H. Cheema A. Sridharan V. Tackett A. Hauer-Jensen M. Boerma M. Koturbash I.

*Role of the alterations in one-carbon metabolism in epigenetic and physiological effects of exposure to densely ionizing radiation [#17330]*

Exposure to densely ionizing radiation causes alterations in the levels of methionine and its downstream metabolites, as well as changes in DNA methylation and expression of LINE-1 retrotransposon.

Sridharan V. Mao X. Cao M. Singh P. Jones T. Campbell-Bleacher M. Nelson G. Hauer-Jensen M. Boerma M.

*EFFECTS OF SPACE RADIATION ON INFLAMMATORY INFILTRATION AND CELL DEATH IN THE HEART AND RETINA [#17331]*

Space radiation caused inflammation and cell death in the heart and retina

Patel Z. Hada M. Kang M. Grande-Allen K.

*Irradiation effects on markers of endothelial dysfunction in a 3-D human cell vascular model [#17332]*

We will present effects of radiation on early markers of DNA damage and endothelial dysfunction in the 3D vascular model.

Bishawi M. Isaac D. Abraham D. Mao L. Slaba T. Kidane Y. Kuchibhatla M. Thompson J. Moseley M. Dewhirst M. Bowles D.

*PROTEOMIC SIGNATURES OF SPACE RADIATION INDUCED CARDIOVASCULAR DEGENERATION [#17333]*

This study tests the hypothesis that the proteomic signatures arising from different space radiation exposure scenarios correlates with the resulting type, onset, and magnitude of cardiovascular dysfunction.

Seawright J. Sridharan V. Cao M. Singh P. Byrum S. Singh S. Landes R. Nelson G. Tackett A. Hauer-Jensen M. Boerma M.

*LONG-TERM CARDIAC FUNCTION AND STRUCTURAL REMODELING IN THE MOUSE HEART AFTER LOW-DOSE 160 OR 1H IRRADIATION [#17334]*

Low-dose HZE radiation may impair cardiac function and promote cardiac structural remodeling up to 9 months after exposure.



Cheema A. Casero D. Gill K. Boerma M. Braun J.

*Modulation of Rat and Rabbit Fecal metabolome by Exposure to Heavy Ion Radiation* [\[#17335\]](#)

An integrated metabolomics and microbiomics approach to delineate short term effects of heavy ion exposure

Cheema A. Landes R. Gill K. Seenivasan V. Boerma M.

*Small Molecule Metabolites as Predictive Biomarkers Cardiovascular Risk of Exposure to Space Radiation* [\[#17336\]](#)

A high resolution mass spectrometry based metabolomics approach to delineate biomarkers of low dose heavy ion exposure

Patel Z. Elgart S. Shavers M. Chappell L. Miller C. Huff J. Semones E. Simonsen L.

*GETTING TO THE HEART OF CARDIOVASCULAR RISK ASSESSMENT IN ASTRONAUTS FOR EXPLORATION CLASS MISSIONS* [\[#17337\]](#)

Since the beginning of manned spaceflight, NASA has recognized the potential risk of cardiovascular decrements due to stressors in the space environment.

Monday, January 23, 2017

Poster Session A: Visual Impairment and Intracranial Pressure

4:30 PM

Exhibit Hall A

ARBEILLE P. AVAN P. ZUJ K. DENISE P.

*Relationship between Jugular vein, Middle Cerebral vein velocity and Intracranial pressure. A dry Immersion Experiment. [#17339]*

Cephalic fluidshift induces always an increase in Jugular vein volume but not necessarily intracranial vein velocity. There is a relationship between Intracranial vein velocity and intra cranial pressure change.

Zanello S. Theriot C. Taibbi G. Vizzeri G. Parsons-Wingerter P.

*Hindlimb suspension in rodents for the study of intracranial pressure, molecular and histologic changes in the eye - A status report - [#17340]*

A status report is presented on this study evaluating hindlimb suspension as a animal model for VIIP

Zanello S. Theriot C. Cheves-Barrios P. Rivera A.

*Hindlimb suspension in rodents for the study of CSF production and resorption - A status report [#17341]*

This study investigates gene expression and histology changes in the brain structures that produce and reabsorb CSF in rats subjected to simulated microgravity by hindlimb suspension.

Main B.

*Update - Discovering and Developing New Vision Care Technologies for NASA [#17342]*

This presentation will provide an update on eye care technology being developed for NASA; such as manual and electronic variable power eyeglasses, and innovative technology to image the astronauts retina and test/monitor other visual systems.

Marshall-Goebel K. Alperin N. Terlevic R. Mulder E. Gerlach D. Rittweger J.

*Lower Body Negative Pressure Reduces Optic Nerve Sheath Diameter during Head-Down Tilt [#17343]*

Optic nerve sheath diameter and intracranial cerebrospinal fluid volume were measured during various degrees of head down tilt and lower body negative pressure was tested as a countermeasure to head-down tilt induced increases in intracranial and orbital cerebrospinal fluid

Bershad E. Marshall-Goebel K. Tang R. Mendoza J. Ni J. Tummula S. Calvillo E. Stevens B. Butt B. Kazmi S. Sangi-Haghpeykar H. Venkatasubba Rao C. Suarez J. Donoviel D.

*CLINICAL VALIDATION STUDY OF THE NEWEST GENERATION OF A NON-INVASIVE ICP METER (VITAMED) [#17344]*

This is a prospective clinical validation of the newest version of a non-invasive intracranial pressure device

Nestorovic N. Hannigan R.

*Development of a Proof-of-Concept in-Flight Unobtrusive Retinal Imaging System*  
[#17345]

This project will demonstrate a proof-of-concept for in-flight retinal imaging, that will be unobtrusive, require minimal crew interaction and training, and provide a pathway to getting quality retinal images without bulky equipment on station.

Smith S. Zwart S. Chang A. Gregory J. Chen J. Leavitt J. Zeisel S. Gibson C. Mader T.

*Astronaut Vision Issues and One-Carbon Metabolism: Expanded Polymorphism Evaluation and Evaluation in a Potential Analog Population* [#17346]

An overview of a new study with two facets: 1) a study evaluating extended one carbon pathway genetics and ophthalmic issues in astronauts and 2) a study evaluating extended one carbon pathway genetics in patients with polycystic ovary syndrome and/or intracranial hypertension.

Schaefer C.

*EXPLORATORY ANALYSIS OF CARBON DIOXIDE LEVELS, ULTRASOUND AND OPTICAL COHERENCE TOMOGRAPHY MEASURES OF THE EYE DURING ISS MISSIONS* [#17347]

This study explores the possible associations of ambient CO<sub>2</sub> levels on the International Space Station compared to structural changes to the eye via inflight ultrasound and optical coherence tomography measures.

Zanello S. Williams M. Bershad E. Levine B. Clark J. Hamilton D. Malm J. Eklund A. Scott J. Hu X. Bergsneider M.

*Zero-G and ICP: Invasive and noninvasive ICP monitoring of astronauts on the ISS & Multimodal modeling towards noninvasive assessment of intracranial pressure* [#17348]

This study seeks to answer the fundamental question of whether VIIP is associated with alterations in intracranial pressure (ICP) or craniospinal compliance and to investigate the molecular signature of the condition.

mann v. Corydon T. Grimm D. Slumstrup L. Sahana J. Askou A. Kopp S. Infanger M. Magnusson N. Bek T. Bauer J. Sundaresan A.

*Adult Retinal Pigmented Epithelial Cells exposed to simulated microgravity: A transformation from adherent cell type to multicellular spheroids* [#17349]

Exposure of Adult Retinal Epithelial Cells to simulated microgravity resulted in cytoskeletal changes in addition to changes in cell growth and expression pattern of genes involved in cell structure, shape, extracellular matrix, migration and angiogenesis.

Strangman G. Zhang Q. Stevens B. Clark J. Mulder E. Bershad E.

*SPACE-COT: Cerebral blood pulsatility during head-down tilt and CO<sub>2</sub> exposure*  
[#17350]

We found cerebral blood volume pulsatility increased in head-down tilt (HDT), and increased further and progressively during HDT with elevated ambient CO<sub>2</sub> concentrations.

Vyas R. Murray M. Predovic M. Lim S. Askin K. Vizzeri G. Taibbi G. Zanello S. Young M. Parsons-Wingerter P.

*ANALYSIS BY NASA'S VESGEN SOFTWARE OF RETINAL BLOOD VESSELS BEFORE AND AFTER 70-DAY BED REST* [#17351]

Potential contributions of retinal vascular remodeling to VIIP etiology were investigated in Heidelberg Spectralis® infrared images acquired before and after 70 days of head down tilt by NASA's VESSEL GENERATION Analysis (VESGEN) software.

Caldwell T. Ebert D. Kemp D. Stenger M. Le Prell C. Danielson R.

*Effects of Middle Ear Pressure and Intracranial Pressure on Transient-Evoked Otoacoustic Emissions* [#17352]

The experiment outlines the effects of middle ear pressure as a potential confounding variable for using transient-evoked otoacoustic emissions as a non-invasive tool to monitor intracranial pressure changes.

Huang A. Balasubramanian S. Tepelus T. Sadda J. Sadda S. Stenger M. Lee S. Laurie S. Liu J. Feiveson A. Macias B.

*Assessment of Intraocular and Systemic Vasculature Pressure Parameters in Simulated Microgravity with Thigh Cuff Countermeasure* [#17353]

The purpose of this project is to evaluate venoconstrictive thigh cuffs as a potential countermeasure to the headward fluid shift-induced effects on intraocular pressure (IOP) and cephalic vascular pressure and volumes.

Stenger M. Laurie S. Lee S.

*IMPACT OF +GZ TO -GZ INDUCED FLUID SHIFTS ON OCULAR AND CEREBRAL PARAMETERS DURING SIMULATED ORION REENTRY* [#17354]

The purpose of this investigation is to examine the pull-push effect on cerebral-ocular structure and hemodynamics during normal ambulatory conditions and while utilizing post-flight, anti-orthostatic countermeasures.

Alperin N. Marshall-Goebel K. Bagci A. Gerlach D. Rittweger J.

*Does Head down Tilt Induce Ocular Changes Similar to Those Observed in VIIP?* [#17355]

The abstract addresses the potential role of the orbital CSF as the cause for ocular deformations in microgravity and in head down tilt.

Ribeiro L. Laurie S. Lee S. Macias B. Martin D. Ploutz-Snyder R. Stenger M. Platts S.

*EFFECTS OF SPACEFLIGHT ON VENOUS AND ARTERIAL COMPLIANCE* [#17356]  
EFFECTS OF SPACEFLIGHT ON VENOUS AND ARTERIAL COMPLIANCE

Laurie S. Basner M. Lathan C. Lovering A. Lee S. Martin D. Stenger M.

*VaPER: CEREBROVASCULAR, COGNITIVE, AND SLEEP ASSESSMENT DURING 30 DAYS OF 6° HEAD-DOWN TILT BED REST IN A 0.5% CO2 ENVIRONMENT* [#17357]

This study will investigate the effects of 30-days of bedrest with 0.5% CO2 on cerebrovascular, cognitive, and sleep outcomes.

Ebert D. Macias B. Sargsyan A. Garcia K. Stenger M. Kemp D. Hargens A. Johnston S.

*Evaluation of an Impedance Threshold Device as a VIIP Countermeasure* [#17358]

This investigation evaluates an impedance threshold device (ITD) as a VIIP countermeasure.

Kemp D. Melgoza R. Ebert D. Danielson R. Stenger M. Hargens A. Dulchavsky S.

*Otoacoustic Emissions in Fluid Shift Studies: Methodology and Confounding Factors* [#17359]

To further validate otoacoustic emission (OAE) results within the Fluid Shifts flight experiment, analysis methods have been refined and expanded to better document and understand the effects of other variables that can affect OAEs.

Smith B. Crowell B. Ozgur O. Goetchius E. Hamilton S. Newby N. Scott J.

*NON-INVASIVE 3-DIMENSIONAL FACIAL MODELING FOR QUANTIFICATION OF FACIAL EDEMA* [#17360]

Our findings indicate that the Structure Sensor 3D scanner and accompanying analysis software may be valid and reliable non-invasive tools in the assessment of cephalic

Fuller C. Gompf H. Hoban-Higgins T. Robinson E. Theriot C. Murphy C. Zanello S.  
*HEAD-DOWN TILT AS A MODEL FOR INTRACRANIAL AND INTRAOCULAR PRESSURES, AND RETINAL CHANGES DURING SPACEFLIGHT* [#17361]  
Progress report on an ongoing VIIP research program.

Melgoza R. Kemp D. Ebert D. Danielson R. Stenger M. Hargens A. Dulchavsky S.  
*A Longitudinal Study of Transient Evoked Otoacoustic Emissions in Relation to Spaceflight (Fluid Shifts)* [#17362]  
Longitudinal changes in otoacoustic emissions were observed in response to fluid shifts that were induced by posture changes, lower body negative pressure, and spaceflight.

Mujat M. Zhao Y. Iftimia N. Ferguson R.  
*OPTICAL SYSTEM FOR MONITORING NET OCULAR BLOOD FLOW* [#17363]  
We present a novel ophthalmic imaging platform that combines non-invasive measurement of retina/choroid structure and ocular blood flow for the characterization and monitoring of visual impairment observed in long-duration space flights.

Hargens A. Watkins W. Petersen L. Macias B.  
*Ground-Based Studies of Headward Fluid Shifts Related to Space Flight* [#17364]  
Long-term space flight decreases visual acuity in more than 50% of astronauts with some reports of post-flight lumbar opening pressures up to 21 mmHg.

**Tuesday, January 24, 2017**

**Results from ISS Research**

**8:00 AM**

**Grand Ballroom**

**Chair: Jennifer Fogarty**

- 8:00 AM Stuster J.  
*Behavioral Issues Associated with Long Duration Space Missions: Review of Astronaut Journals* [#17197]  
Results of a content analysis of 20 astronaut journals conducted during a 13-year period are presented.
- 8:30 AM Thaxton S. Greene M. Williams T. Schuh S. Archer R. Vasser K.  
*ISS Habitability Data Collection and Preliminary Findings* [#17198]  
Description of data collection methods and preliminary findings from an assessment of habitability and human factors on International Space Station.
- 9:00 AM Dinges D. Basner M. Mollicone D. Ecker A. Jones C. Mott C. Hyder E. Di Antonio A. Dennis L. Kan K.  
*PVT ON ISS: REACTION SELF-TEST (RST) FROM 6-MONTH MISSIONS* [#17199]  
N = 24 astronauts on the International Space Station completed Reaction Self Test assessments designed to quickly determine the effects of spaceflight on behavioral alertness.
- 9:30 AM Break

Tuesday, January 24, 2017

Exploration Exercise Device Development and Supporting Analyses

9:45 AM

Yacht

**Chairs:** Gail Perusek and Beth Lewandowski

- 9:45 AM Perusek G. Funk J. DeWitt J. Bruinsma D. Vos J. Haven C.  
[MPCV Exercise Device Development Overview \[#17060\]](#)  
Describes the development path for Exploration exercise equipment and the device in development for the MPCV
- 10:00 AM Funk J. Perusek G. Funk N. Kutnick G. Caraozzoni M. Vachon D. Bruinsma D.  
[ATLAS DEVICE DEVELOPMENT OVERVIEW \[#17061\]](#)  
Over the last few years, the Human Research Program (HRP) has led development of advanced exercisecountermeasures hardware for spaceflight to provide effective resistive and aerobic exercise capability to the crew.
- 10:15 AM De Witt J. Fincke R. Ploutz-Snyder L.  
[Multi-Purpose Crew Vehicle Exercise Devices – Objective and Subjective Testing of 4 Candidate Devices \[#17062\]](#)  
Compact exercise device prototypes were evaluated for exercise function and the results were used to inform the downselect process.
- 10:30 AM Downs M. Kalogera K. Newby N. Scott J. Maynard C. Donnan S. Moore C. Zumbado F.  
[Miniature Exercise Device-2 \(MED-2\) ISS Flight Study \[#17063\]](#)  
In order to fully test the MED-2 efficacy as a potential MPCV exercise device, both software and hardware functionality and physiological performance will need to be evaluated on ISS.
- 10:45 AM Godfrey A. Humphreys B. Funk J. Perusek G. Lewandowski B.  
[MPCV EXERCISE OPERATIONAL VOLUME ANALYSIS \[#17064\]](#)  
Motion capture data was used in conjunction with OpenSim and a CAD model of an allotted volume for exercise within the MPCV to determine whether or not subjects of varying heights can remain contained within the volume while exercising uninhibited.
- 11:00 AM Humphreys B. Godfrey A. Perusek G. DeWitt J. Finke R. Lewandowski B.  
[MPCV Exercise Device Interface Loads Results \[#17065\]](#)  
Candidate MPCV exercise device vehicle interface loads have been measured, analyzed, and will be reported.
- 11:15 AM Break [#17066]



Tuesday, January 24, 2017

Exploration Medical Capability Information Resources: Integrated Medical Model

9:45 AM

Galleon I

**Chairs:** Tianna Shaw and Mohana Gurram

- 9:45 AM Myers J. Garcia Y. Griffin D. Arellano J. Boley L. Goodenow D. Kerstman E. Reyes D. Saile L. Walton M. Young M.  
[The Integrated Medical Model: Outcomes from Independent review\[#17083\]](#)  
The planning, implementation and outcomes of the external, independent assessment of the Integrated Medical Model v4.0 is discussed and lessons learned identified.
- 10:00 AM Boley L. Arellano J. Kerstman E. Reyes D.  
[RISK PROBABILITY OF IN-FLIGHT RENAL STONES – AN INTEGRATED MEDICAL MODEL OPERATIONAL USE CASE \[#17084\]](#)  
This presentation will illustrate one specific Integrated Medical Model (IMM) use case in which the customer asked the question, "What is the risk probability of crewmember(s) developing renal stones in flight on any of eight specified design reference missions (DRMs)?"
- 10:15 AM Kerstman E.  
[MEDICAL UPDATES TO THE INTERNATIONAL SPACE STATION PROBABILISTIC RISK ASSESSMENT MODEL USING THE INTEGRATED MEDICAL MODEL - AN INTEGRATED MEDICAL MODEL OPERATIONAL USE CASE \[#17085\]](#)  
This presentation describes a use case of the Integrated Medical Model.
- 10:30 AM Arellano J. Boley L. Kerstman E. Reyes D. Saile L.  
[RISK FOR SHORT-TERM MULTI-PURPOSE CREW VEHICLE MISSIONS – AN INTEGRATED MEDICAL MODEL OPERATIONAL USE CASE \[#17086\]](#)  
The IMM Project presents an operational use case, a service request in support of the Multi-Purpose Crew Vehicle Exploration Mission-2 Critical Design Review and Exploration Systems Development Build-to-Sync milestone in support of the Cross-Program Probabilistic Risk Assessment Team.
- 10:45 AM Kassemi M. Thompson D. Goodenow D. Gokoglu S. Myers J.  
[Coupled CFD-PBE Prediction of Renal Stone Size Distributions in the Nephron under Weightlessness and Upon Reentry into a Gravitational Field \[#17087\]](#)  
A deterministic CFD-PBE model is used to predict CaOx renal stones size distributions in weightlessness and upon reentry into a gravitational field.
- 11:00 AM Goodenow D. Graham K. Arellano J. Myers J.  
[Optimization Routine for Generating Medical Kits for Spaceflight Using the Integrated Medical Model \[#17088\]](#)  
This optimization routine that acts an extension of the Integrated Medical Model (IMM) to efficiently generate optimal medical kits for human spaceflight missions, given a benefit constraint.
- 11:15 AM Break [#17089]

Tuesday, January 24, 2017

Human Exploration Research Analog Panel

9:45 AM

Hilton Crystal Ballroom

**Chairs:** Jason Schneiderman and Brandon Vessey

- 9:45 AM Hillenius S. Marquez J. Korth D. Rosenbaum M.  
[Evaluation of Crew-Centric Onboard Mission Operations Planning and Execution Tool \[#17156\]](#)  
Current results of our work to inform the design of systems for more autonomous crew operations and provide a platform for research on crew autonomy for future deep space missions.
- 10:00 AM Driskell T. Salas E. Driskell J. Iwig C.  
[INTER- AND INTRA- CREW DIFFERENCES IN STRESS RESPONSE: A LEXICAL PROFILE \[#17157\]](#)  
We describe summary data from HERA Campaign 2 to examine inter- and intra- crew differences in stress response using lexical analysis.
- 10:15 AM Abeln V.  
[Psychophysiological changes during 30-days of isolation in the Human Exploration Research Analog \(HERA\) \[#17158\]](#)  
Introduction: Sleep, mood and cognitive impairments are known to occur during space and isolation mission. To date, underlying mechanisms are unclear and efficient countermeasures missing.
- 10:30 AM McGuire S. Dinges D. Ecker A. Nasrini J. Hermosillo E. Basner M.  
[Activity Levels, Sleep Patterns, and Proximity Measurements in a Human Exploration Research Analog \(HERA\) \[#17159\]](#)  
Measurements of activity and proximity were completed during 4 missions in NASA's Human Exploration Research Analog.
- 10:45 AM Goel N. Dennis L. Ecker A. Bhatnagar S. Kirkpatrick J. Weljie A.  
[BIOMARKERS AS PREDICTORS OF RESILIENCY AND SUSCEPTIBILITY TO STRESS IN SPACE FLIGHT \[#17160\]](#)  
The aim of this project is to validate biomarkers as predictors of susceptibility or resiliency to the neurobehavioral effects of stress and sleep loss for use in space flight in short-duration and long-duration analogs.
- 11:00 AM Discussion [#17161]
- 11:15 AM Break [#17162]

**Tuesday, January 24, 2017**

**Immunology and Microbiology**

**9:45 AM**

**Grand Ballroom**

**Chairs: Brian Crucian and Cherie Oubre**

9:45 AM      Introductory Remarks **[#17163]**

9:50 AM      Bigley A. Mylabathula P. Agha N. Li L. Mehta S. Crucian B. Pierson D. Laughlin M. Rezvan K. Simpson R.  
*[THE ROLE OF MICROGRAVITY IN DYSREGULATED NK-CELL FUNCTION AND CMV-SPECIFIC T-CELL RESPONSES DURING SPACEFLIGHT](#)* **[#17164]**  
Before we can feasibly send Astronauts to distant locations in space, such as Mars or asteroids, it is critical that we understand how spaceflight affects the human immune system.

10:05 AM      Crucian B. Mathias B. Alexander S. Kunz H. Nelman-Gonzalez M. Chew D. Mehta S. Pierson D. Chouker A.  
*[Assessment of Normoxic Coastal Antarctic Winterover as an Analog for Spaceflight Immune Dysregulation: The 'CHOICE-Coastal' Investigation](#)* **[#17165]**  
Preliminary data suggest Antarctic winterover at the normoxic Neumayer station may be an analog for spaceflight-associated immune dysregulation. The Choice-Coastal investigation will provide an assessment of immune alterations at Neumayer for direct comparison with in-flight changes.

10:20 AM      Simpson R. Bigley A. Spielmann G. Kunz H. Agha N. Baker F. Rooney B. Mylabathula P. Graff R. Laughlin M. Mehta S. Pierson D. Crucian B.  
*[Long duration spaceflight impairs NK-cell function in ISS crewmembers: findings from the 'Salivary Markers' project](#)* **[#17166]**  
Robust immunity is essential for further human exploration of the solar system beyond Earth's orbit.

10:35 AM      Voorhies A. Mehta S. Crucian B. Torralba M. Moncera K. Feiverson A. Pierson D. OTT C. Lorenzi H.  
*[STUDY OF THE IMPACT OF LONG-TERM SPACE TRAVEL ON THE ASTRONAUTS' MICROBIOME](#)* **[#17167]**  
This abstract describes the microbiome changes experienced by astronauts on 6 month missions to ISS.

10:50 AM      Discussion **[#17168]**

11:15 AM      Break **[#17169]**

Tuesday, January 24, 2017

**In-Flight Central Nervous System 3: Accumulating bad connections and what they're made of**

**9:45 AM**

**Galleon II & III**

**Chair: Kerry O'Banion**

- 9:45 AM WYROBEK A. RABIN B. BRITTEN R. BHATNAGAR S. PETERSON L. STRAUME T. WITKOWSKA H.  
*COMPARATIVE BEHAVIORAL RESPONSES TO LOW-DOSE <sup>56</sup>Fe PARTICLE EXPOSURES AND CNS PROTEOMICS OF INTER-INDIVIDUAL VARIATION IN ANXIETY PERFORMANCE IN MALE RATS* [#17183]  
Individuals showed large variations in behavioral responses to low-dose HZE exposures and molecular profiling of CNS subregions identified proteins associated with anxiety response, offering a novel approach to protecting individuals who may be more susceptible to low-dose radiation.
- 10:05 AM O'BANION M. DEANE R. MAJEWSKA A. WILLIAMS J. OLSCHOWKA J.  
*IMPACT OF SPACE-RADIATION INDUCED ALTERATIONS ON TOXIC PROTEIN ACCUMULATION ASSOCIATED WITH NEURODEGENERATIVE DISEASE* [#17184]  
Study explores the potential role of radiation-induced changes in beta-amyloid clearance from the brain as a mechanism underlying potential changes in Alzheimer's pathology observed in a mouse model following space radiation exposure.
- 10:25 AM LEMERE C. LIU B. LIU G. KOPACZ K. SHI Q. TROJANCZYK L. PARK M. WANG S. BELANGER A. DUBEY S. HOLTON P. LORELLO P. MCKINNEY A. REISER V. TRIGG W. O'BANION M. DICARLI M. CALDARONE B.  
*Long-term Sex-Specific CNS Effects of <sup>56</sup>Fe Radiation in WT Mice and Alzheimer's Disease APP/PS1 Tg Mice* [#17185]  
We observed dose-, sex- and genotype-specific long-term effects of <sup>56</sup>Fe irradiation on behavior, neuroinflammation and amyloid-beta levels mice, and in particular, worsening in male, but not female, transgenic mice.
- 10:45 AM ROSI S. KRUKOWSKI K. JOPSON T. YANG P. RIPARIP L. FENG X. JONES T. HUANG T.  
*THE ROLE OF OXIDATIVE STRESS AND INFLAMMATION ON SYNAPTIC FUNCTIONS AFTER EXPOSURE TO SPACE RADIATION* [#17186]  
Irradiation of the central nervous system (CNS) can significantly affect brain structures critical for cognitive function.
- 11:05 AM Discussion [#17187]
- 11:15 AM Break [#17188]

Tuesday, January 24, 2017

Approaches to Human Health Risk Assessment

1:00 PM

Galleon II & III

Chair: Janice Huff

- 1:00 PM Huff J. Patel Z. Simonsen L.  
*NASA SPACE RADIATION PROTECTION STRATEGIES – RISK ASSESSMENT AND PERMISSIBLE EXPOSURE LIMITS* [#17013]  
Permissible exposure limits (PELs) for short-term and career astronaut exposures to space radiation have been set and approved by NASA with the goal of protecting astronauts against health risks associated with ionizing radiation exposure.
- 1:20 PM Blattnig S.  
*Role of Radiation Quality and Dose Rate Effects in NASA Radiation Risk Projections* [#17014]  
A discussion of radiation quality and dose rate effects in NASA risk model will be presented.
- 1:40 PM Loucas B. Cornforth M.  
*THE PRODUCTION OF CHROMOSOMAL EXCHANGES BY IONS OF DIFFERENT ENERGIES BUT THE SAME LET* [#17015]  
Track interaction produces chromosome exchange breakpoint dose response curvature.
- 2:00 PM Shuryak I. Fornace A. Datta K. Suman S. Kumar S. Brenner D.  
*Modeling low dose RBE for heavy ion intestinal carcinogenesis using targeted and non-targeted effects* [#17016]  
According to our model, non-targeted effects of radiation can account for much of the heavy ion-induced cancer risk at doses relevant for astronauts.
- 2:20 PM Discussion [#17017]
- 2:30 PM Break [#17018]

Tuesday, January 24, 2017

**Biomechanical and Musculoskeletal Computational Modeling**

**1:00 PM**

**Yacht**

**Chairs: William Thompson and Beth Lewandowski**

- 1:00 PM Gallo C. Thompson W. Jagodnik K. Lewandowski B. DeWitt J.  
[\*BIOMECHANICAL MODELING ANALYSIS OF LOADS CONFIGURATION FOR SQUAT EXERCISE\*](#) [#17019]  
Results presented for the squat exercise on the hybrid ultimate lifting kit.
- 1:18 PM Thompson W. Gallo C. DeWitt J. Humphreys B. Jagodnik K. Lewandowski B.  
[\*VERIFICATION AND VALIDATION STRATEGIES FOR BIOMECHANICAL MODELS DEVELOPED FOR the DIGITAL ASTRONAUT PROJECT\*](#) [#17020]  
We present several strategies for V&V including comparative analysis of ground reaction data, EMG data, modeling external loading in an optimized sense to minimize residuals, and sensitivity analyses of the model's outcomes to measurement error and to uncertainties in model parameters.
- 1:36 PM Humphreys B. Dembia C. Lewandowski B. van den Bogert A.  
[\*Implicit Formulation of Muscle Dynamics in OpenSim\*](#) [#17021]  
An implicit dynamic muscle model has been implemented incorporated in OpenSim and is being used to perform predictive biomechanic simulations.
- 1:54 PM Pennline J. Mulugeta L. Werner C. Lewandowski B.  
[\*Development of a Daily Load Stimulus Formula for Spaceflight Musculoskeletal Research\*](#) [#17022]  
We review existing formulas, develop a new bone daily load stimulus formula, and test its ability to estimate the amount of daily bone stress required for maintenance.
- 2:12 PM Lewandowski B. Myers J. Sibonga J.  
[\*SENSITIVITY ANALYSIS OF THE BONE FRACTURE RISK MODEL\*](#) [#17023]  
A parameter sensitivity study is explained that is aimed at identifying those parameter uncertainties that most effect forecasts of bone fracture.
- 2:30 PM Break [#17024]

Tuesday, January 24, 2017

Brain and Behavior Changes under Spaceflight Stressors

1:00 PM

Hilton Crystal Ballroom

**Chairs:** Mihriban Whitmore and Alexandra Whitmire

- 1:00 PM Dayal D. Donoviel D. Stevens B. Hazel R. Scott R. Jesudasan S. Izkovic V. Strangman G. Basner M. Nasrini J. Clark J.  
[COGNITIVE STUDY OF TILT EFFECTS \(CUTE Study\) \[#17025\]](#)  
Correlating functional neurocognitive testing and non-invasive imaging of brain hemodynamics in a microgravity analog of head-down tilt
- 1:15 PM CO2 Study Results [#17026]
- 1:30 PM Ryder V. Scully R. Alexander D. Lam C. Young M. Satish U. Basner M.  
[Effects of Acute Exposures to Carbon Dioxide upon Cognitive Functions \[#17027\]](#)  
Results of cognitive measures following acute exposure to CO2 in crew-like subjects at various flight-relevant exposure concentrations will be presented.
- 1:45 PM Stahn A. Gunga H. Chouker A. Dinges D. Basner M. Kuehn S.  
[Long-duration Antarctic Overwintering Suppresses Hippocampal Plasticity, Cognitive Performance and Key Neurotrophins \[#17028\]](#)  
Here we show that 14 months of isolation and confinement associated with long-duration stay at an Antarctic expedition station have detrimental subregion-specific effects on hippocampal structure and function in healthy human adults.
- 2:00 PM Seidler R. Mulavara A. Koppelmans V. Kofman I. Cassady K. Yuan P. De Dios Y. Gadd N. Riascos R. Wood S. Bloomberg J.  
[SPACEFLIGHT EFFECTS ON NEUROCOGNITIVE PERFORMANCE: EXTENT, LONGEVITY AND NEURAL BASES \[#17029\]](#)  
We will present preliminary results from our ongoing flight study which is investigating brain and behavioral changes with spaceflight.
- 2:15 PM Discussion [#17030]
- 2:30 PM Break [#17031]



Tuesday, January 24, 2017

Exploration Medical Capability Information Resources

1:00 PM

Galleon I

**Chairs:** Tianna Shaw and Mohana Gurram

- 1:00 PM Rubin D. Shah R. Kerstman E. Reyes D. Mulcahy R. Antonsen E.  
[Medical Optimization Network for Space Telemedicine Resources \[#17076\]](#)  
The MONSTR tool is a novel approach to assess the relative value of individual resources needed for the diagnosis and treatment of medical conditions
- 1:15 PM Ebert D. Byrne V. McGuire K. Hurst IV V. Kerstman E. Cole R. Sargsyan A. Garcia K. Stephenson J. Hailey M. Reyes D. Young M. Dulchavsky S. Gibson C.  
[Clinical Outcome Metrics for Optimization of Robust Training \(COMfORT\) \[#17077\]](#)  
The COMfORT project addresses the clinical outcome differences between physicians and non-physicians in both near-term clinical metrics and long-term mission outcomes.
- 1:30 PM Krihak M. Middour C. Lindsey T. Marker N. Wolfe S. Winther S. Ronzano K. Bolles D. Toscano B. Shaw T.  
[Medical Data Architecture Project Status \[#17078\]](#)  
This paper highlights the MDA objectives, development processes, and accomplishments, and identifies the fiscal year 2017 milestones and deliverables in the upcoming year.
- 1:45 PM Middour C. Krihak M. Lindsey A. Marker N. Wolfe S. Winther S. Ronzano K. Bolles D. Toscano W. Shaw T.  
[MEDICAL DATA ARCHITECTURE PROJECT CAPABILITIES AND DESIGN \[#17079\]](#)  
Mission constraints will challenge the delivery of medical care on a long-term, deep space exploration mission. The Medical Data Architecture (MDA) project will enable medical care capability in this constrained environment.
- 2:00 PM Lindsey T. Salinas J. Antonsen E.  
[AUTOMATED ULTRASOUND DIAGNOSTIC ASSISTANT: A NASA USAISR COLLABORATION \[#17080\]](#)  
Computerized ultrasound diagnostic algorithm development for prolonged field care and delivery of healthcare in space.
- 2:15 PM Discussion [#17081]
- 2:30 PM Break [#17082]

Tuesday, January 24, 2017

Spaceflight-Induced Cardiovascular Health Risk Assessment

1:00 PM

Grand Ballroom

**Chairs:** Stuart Lee and Benjamin Levine

- 1:00 PM Lee S. Martin D. Smith S. Zwart S. Laurie S. Ribeiro C. Stenger M.  
[DEFINING THE RELATIONSHIP BETWEEN BIOMARKERS OF OXIDATIVE AND INFLAMMATORY STRESS AND THE RISK FOR ATHEROSCLEROSIS IN ASTRONAUTS DURING AND AFTER LONG-DURATION SPACEFLIGHT \[#17547\]](#)  
The purpose of this investigation is to determine whether biomarkers of oxidative and inflammatory stress are elevated during and after long-duration spaceflight and to determine whether a relation exists between biomarkers and structural and functional indices of atherosclerotic risk.
- 1:15 PM DeLemos J.  
[Improving CV Risk Prediction \[#17548\]](#)  
Current strategies for cardiovascular disease (CVD) risk assessment among adults without known CVD are limited by suboptimal performance and a narrow focus on only atherosclerotic CVD (ASCVD).
- 1:30 PM Charvat J. Lee S. Davenport E. Barlow C. Radford N. DeFina L. Stenger M. Van Baalen M.  
[Cardiovascular Disease Risk in NASA Astronauts Across the Lifespan: Historical Cohort Studies \[#17550\]](#)  
In order to fully understand cardiovascular risk in astronauts as they age, two historical cohort studies are being conducted comparing NASA Astronauts to two cohorts, US Air Force Aviators and the Cooper Center Longitudinal Study (a generally healthy prevention cohort).
- 1:45 PM Grabham P.  
[Blood capillaries in the space environment \[#17551\]](#)  
The effects of charged particles and simulated microgravity on the angiogenesis of human micro-vessel models
- 2:00 PM Natarajan M. Aravindan N. Mohan S.  
[Hemodynamic Flow-Induced Mechanotransduction Signaling Influences the Radiation](#)  
Radiation-induced injury to the endothelium, which permeates every tissue and organ, will lead to tissue toxicity and results in multi-organ dysfunction.
- 2:15 PM Discussion
- 2:30 PM Break [#17553]

**Tuesday, January 24, 2017**

**Exploration Medical Capability Closed Session I**

**3:00 PM**

**Galleon I**

3:00 PM      Discussion [#17067]

4:30 PM      Break

Tuesday, January 24, 2017

Markers for Individualizing Countermeasures in Exploration

3:00 PM

Hilton Crystal Ballroom

**Chairs:** Lauren Leveton and Laura Bollweg

- 3:00 PM Lockley S. St. Hilaire M. Rahman S. Kristal B. Sullivan J. Quackenbush J. Duffy J. Barger L. Czeisler C.  
*DEVELOPMENT AND TESTING OF BIOMARKERS TO DETERMINE INDIVIDUAL ASTRONAUTS' VULNERABILITIES TO BEHAVIORAL HEALTH DISRUPTIONS* [#17206]  
The goal of this study is to identify a candidate panel of biomarkers to determine individual astronauts' vulnerabilities to sleep loss and circadian rhythm disruption.
- 3:20 PM Dinges D. Basner M. Goel N. Rao H. McGuire S. Hermosillo E. Dennis L. Carlin P. Trentalange M. Lin L. Mignot E.  
*MARKERS OF SUSCEPTIBILITY TO NEUROBEHAVIORAL DECREMENTS IN SPACE FLIGHT* [#17207]  
This project seeks to identify and validate objective pre-mission markers of susceptibility to neurobehavioral performance deficits and neurobehavioral fatigue from sleep loss associated with long-duration space flight.
- 3:40 PM Perlman G. Shteynberg Y. Ruggero C. Foti D. Kotov R.  
*Personality and Biological Predictors of Resiliency to Chronic Stress Among High-Achieving Adults* [#17208]  
Long-duration space flight will be associated with numerous, chronic stressors that induce behavioral health problems (i.e., mood change, anxiety, etc.) and reduce cognitive performance (slow reaction time, reduced accuracy).
- 4:00 PM Contractor N. Gibson Z. DeChurch L. Bell S.  
*COMPOSING EFFECTIVE SPACE CREWS: PREDICTING CREW CAMRADERIE* [#17209]  
An inferential network model is developed to identify which individual differences, especially personality, emotion regulation, and self-monitoring, impact the formation, maintenance, and dissolution of affective relationships over time.
- 4:20 PM Discussion [#17210]
- 4:30 PM Break [#17211]

**Tuesday, January 24, 2017**

**Sensorimotor Flight and Ground Studies**

**3:00 PM**

**Grand Ballroom**

**Chairs: Jacob Bloomberg and Ajitkumar Mulavara**

- 3:00 PM Reschke M. Kozlovskaya I. Kofman I. Tomilovskaya E. Cerisano J. Rosenberg M. Bloomberg J. Stenger M. Lee S. Laurie S. Rukavishnikov I. Fomina E. Wood S. Mulavara A. Feiveson A. Fisher E.  
[UPDATE OF THE JOINT NASA RUSSIAN FIELD TEST\[#17511\]](#)  
A preliminary report of the current results associated with the primary Field Test.
- 3:20 PM Seidler R. Mulavara A. Koppelmans V. Kofman I. Cassady K. Yuan P. De Dios Y. Gadd N. Riascos R. Wood S. Bloomberg J.  
[SPACEFLIGHT EFFECTS ON NEUROCOGNITIVE PERFORMANCE: EXTENT, LONGEVITY AND NEURAL BASES \[#17512\]](#)  
We will present preliminary results from our ongoing flight study which is investigating brain and behavioral changes with spaceflight.
- 3:50 PM Mulavara A. Peters B. De Dios Y. Gadd N. Caldwell E. Watson C. Oddsson L. Kreuzberg G. Zanello S. Clark T. Oman C. Cohen H. Wood S. Seidler R. Reschke M. Bloomberg J.  
[BEHAVIORAL, BRAIN IMAGING, AND GENOMIC MEASURES TO PREDICT FUNCTIONAL OUTCOMES AFTER BED REST AND SPACEFLIGHT \[#17513\]](#)  
  
The ability to predict the manner and degree to which individual astronauts are affected will improve the effectiveness of countermeasure training programs designed to enhance sensorimotor adaptability
- 4:10 PM Young L. Karmali F. Galvan-Garza R. Rosenberg M. Diaz Ariles A. Oman C. David S. Natapoff A. Kenyon R. Clark T.  
[SPATIAL ORIENTATION AND MANUAL CONTROL IN REDUCED GRAVITY\[#17514\]](#)  
We quantified changes in perception and manual control ability in multiple altered gravity levels using a centrifuge test paradigm and investigated the effect of promethazine on basic vestibular function.
- 4:30 PM Break [#17515]

Tuesday, January 24, 2017

**Simulating the Space Environment – The Good, the Bad, and the Ugly**

**3:00 PM**

**Galleon II & III**

**Chairs: Adam Rusek and Peter Guida**

- 3:00 PM Guida P. Rusek A.  
[NSRL User Group: Biology and Operations \[#17516\]](#)  
This presentation will be the annual NSRL User Group forum, where facility operations and logistics are presented and then discussed openly with the NSRL user community.
- 3:15 PM Guida P. Rusek A.  
[NSRL User Group: Biology and Operations \[#17517\]](#)  
This presentation will be the annual NSRL User Group forum, where facility operations and logistics are presented and then discussed openly with the NSRL user community.
- 3:30 PM Weil M. Ray F. Borak T.  
[STATUS OF THE NEUTRON RADIATION FACILITY AT COLORADO STATE UNIVERSITY \[#17518\]](#)  
Progress on the development of a facility that will allow large numbers of rodents to be exposed to chronic, low dose rate neutron irradiation for time spans up to and exceeding one year will be reported.
- 3:45 PM Simonsen L.  
[Galactic Cosmic Ray Simulator Experimental Validation Consortium \[#17519\]](#)  
The GCR Simulator Experimental Validation Consortium was formed to enhance outcomes from early GCR simulation design experiments by aligning irradiation parameters and models to validate results across multiple endpoints.
- 3:55 PM Galactic Cosmic Ray Panel Discussion [\[#17520\]](#)
- 4:30 PM Break [\[#17521\]](#)

Tuesday, January 24, 2017

Visual Impairment and Intracranial Pressure Computational Modeling

3:00 PM

Yacht

**Chairs:** Emily Nelson and Beth Lewandowski

- 3:00 PM Myers J. Werner C. Nelson E. Feola A. Raykin J. Samuels B. Ethier C.  
*Modeling Microgravity Induced Fluid Redistribution Autoregulatory and Hydrostatic Enhancements* [#17594]  
Addition of a quasi-static time stepping approach to adding auto-regulation and hydrostatics to a lumped parameter model of the cardiovascular and cerebral spinal fluid system is discussed.
- 3:22 PM Nelson E. Myers J. Feola A. Raykin J. Samuels B. Ethier C.  
*Ocular modeling for VIIP syndrome: How experimental and numerical studies can collaborate* [#17595]  
In developing our numerical model, which predicts gravity-driven dynamic changes in intraocular pressure and ocular blood volume, we found that experimental evidence was greatly needed in many areas, and wanted to highlight the complementary roles of numerical and experimental studies.
- 3:45 PM Ethier C. Feola A. Myers J. Nelson E. Raykin J. Samuels B.  
*INTEGRATED MODEL OF THE EYE/OPTIC NERVE HEAD BIOMECHANICAL ENVIRONMENT* [#17596]  
An integrated model approach to investigate the biomechanical loading environment of the optic nerve head and posterior nerve.
- 4:07 PM Phillips S. Chepko A. Archambault-Leger V. Kattamis N. Knaus D. Anderson A. Zegans M. Buckey J.  
*NUMERICAL MODELING OF EYE STRUCTURE AND THE CEREBROVASCULAR/CEREBROSPINAL CIRCULATION* [#17597]  
Current progress on our efforts to combining computer modeling and human subject testing to determine how changes in hydrostatic gradients, fluid distribution, tissue weight, and cranial venous anatomy can influence microgravity-induced visual changes.
- 4:30 PM Break [#17598]



Tuesday, January 24, 2017

Poster Session B: Exploration Medical Capability

4:30 PM

Exhibit Hall A

ARBEILLE P. SACCOMANDI A. ANDRE E. de La PORTE C. ZUJ K.

*Tele-operated echography and remote guidance for performing tele-echography on geographically isolated patients. [#17365]*

The use of Remote Guidance was sufficient for superficial vessel (arteries and vein) examinations but was not suited for deep or superficial organs. Assessment of superficial and deep organs was best accomplished using the Motorized Probe.

Martin D. Wang L. Lee S. Stenger M. Laurie S. Fleischer A. Gibson C.

*AUTONOMOUS DIAGNOSTIC IMAGING PERFORMED BY UNTRAINED OPERATORS USING AUGMENTED REALITY AS A FORM OF "JUST-IN-TIME" TRAINING FOR EXPLORATION MISSIONS [#17366]*

An information rich augmented reality system designed to guide untrained operators through medical imaging procedures will be compared to more traditional instructional material with the goal of facilitating improved autonomy on future exploration missions.

Khokhlova V. Dunmire B. Kucewicz J. Khokhlova T. Kreider W. Schade G. Maxwell A. Sapozhnikov O. Farr N. Wood B. Partanen A. Crum L. Khokhlova V.

*Development and validation of therapeutic ultrasound for bloodless surgery in an analog environment [#17367]*

Presenting a training test-bed phantom for high intensity focused ultrasound (HIFU) therapies that can be imaged and monitored with a Flexible Ultrasound System (FUS).

Pantalos G. Crigger M. Warner S. Lents G. Mallonee C. Pereira D. Harrison S. Ackermann L. Higginson T. Barrow B. Callahan S. Armagno A. Fairfax J. Roussel T. Sutton E. Sharp K. Burgess J. Antaki J.

*Parabolic and Suborbital Flight Evaluation of an Aqueous immersion Surgical System for Reduced Gravity [#17368]*

We continue the development of an Aqueous Immersion Surgical System (AISS) which is a clear enclosure to permit minimally invasive and open surgical procedures within a localized aqueous environment. AISS controls bleeding, cleansing the wound, and maintaining a clear operative field.

Goodenow D. Myers J. Gokoglu S. Kassemi M.

*Forecasting the Change of Renal Stone Occurrence Rates in Astronauts [#17369]*

This model forecasts the change of renal stone occurrence rates in astronauts based on urine chemistry.

Griko Y. Peletskaya E.

*Personalized risk assessment for adverse drug reactions and treatment failures [#17370]*

Evaluation of the personalized prescribing system for targeted medication management

Chan E. Bae C. Bearg S. Han C. Bell A. Eames D. Atkin M.

*rHEALTH X with Integrated Sample Preparation and Comprehensive Vitals Monitor [#17371]*

The need for autonomous diagnosis by crew members is particularly important for long-duration space travel. Lack of medical assistance, confined environments and real-time communications can exacerbate the challenges in responding to medical emergencies.

Tuesday, January 24, 2017

Poster Session B: Human Factors and Behavioral Performance

4:30 PM

Exhibit Hall A

Newton D. LePine J. Wellman N.

*Living in the past of moving on? The effects of crew member task engagement following task transitions* [#17372]

Our research seeks to identify the mechanisms that explain how crew member work engagement ebbs and flows, and the consequences of these effects.

Olenick J. Morrison M. Dixon A. Dishop C. Harvey R. Karner J. Chang C. Kozlowski S.

*Using Linguistic Analysis Tools to Study Teams in ICE Environments* [#17373]

This study explores the addition of linguistic analysis tools to the study of daily diary data collected from science teams in the antarctic in an effort to better understand team processes and performance in extreme environments.

Clark T. Salazar G. Brainard G. Schwing B. Kolomenski A. Hanifin J. Venus D. Litaker H. Tran K.

*Computational Modeling to Limit the Impact Displays and Indicator Lights Have on Habitable Volume Operational Lighting Constraints* [#17374]

This project evaluated the impact displays and indicators have on the planned architectural ambient light spectrum and determined potential design implementations to mitigate found impacts.

Wu P.

*VIRTUAL REALITY BASED PLATFORM FOR A NON-INTRUSIVE LINGUISTIC BASED METHOD FOR EVALUATING EFFECTS OF TEAM COMPOSITION ON TEAM PERFORMANCE.* [#17375]

Virtual reality based game as a low cost method of assessing team-based variables as predictor of team performance

Vos G. Fink P. Williams R.

*A Tool for the Automated Collection of Space Utilization Data* [#17376]

The objective of this project is to develop an automated three dimensional space utilization data collection system which delivers data useful in the analysis of vehicle habitability pertaining to crew activities on the ISS as well as potential long duration space missions.

Tannenbaum S. Maynard T. Mathieu J.

*Team Adaptation and Resilience in Extreme Environments: Deep Sea Dive Teams* [#17377]

Describes a new research program studying team adaptation in saturation dive teams.

Fischer U. Mosier K.

*A RESEARCH APPROACH TO UNDERSTANDING KEY COMPONENTS OF SUCCESSFUL AUTONOMOUS SPACE MISSIONS* [#17378]

We describe our research approach to examining and modeling the relationship between crew autonomy and team effectiveness both of the crew and the Multiteam System comprised of crew and Mission Control.

Orr M. Dunn J.

*ENHANCEMENT OF CREW HONESTY IN SELF-AWARENESS AND SELF-REPORT OF HEALTH STATES* [#17379]

The development of a conceptual understanding of integrated psychological and technological methods to optimize crew honesty in self-awareness and self-report of health states.

Shuffler M. Kramer W. Savage N. Verhoeven D.

*MAXIMIZING FUNCTIONALITY WHILE MINIMIZING DYSFUNCTIONALITY: CONSIDERATIONS FOR MULTITEAM SYSTEMS IN LONG DURATION SPACEFLIGHT MISSIONS* [#17380]

This qualitative research leveraging interviews with spaceflight experts provides insight into the need for a more integrative understanding of the factors that may positively facilitate as well as intentionally challenge the performance of multiteam systems involved in spaceflight.

Yule S. Robertson J. Gupta A. Dias R. Lipsitz S. Smink D. Pozner C. Doyle T. Musson D.

*DEVELOPING AND VALIDATING SPECIFIC MEDICAL EVENT MANAGEMENT TRAINING PROTOCOLS FOR FLIGHT CREWS ON CISLUNAR SPACE EXPLORATION MISSIONS* [#17381]

In-flight medical emergencies represent a significant risk to crew safety and mission success; by designing countermeasures in the form of simulation-based behavioral skills training, these risks can be ameliorated on deep-space, long duration exploration missions.

Bartone P. Krueger G. Roland R. Sciarretta A. Bartone J. Johnsen B.

*Individual Differences in Adaptability for Long Duration Space Exploration Missions* [#17382]

Conducted a systematic literature review and operational interviews to identify factors associated with individual adaptability in long duration, isolated, confined and extreme (ICE) mission environments.

Duda K. Stankovic A. York S. Handley P. West J. Robinson S.

*Real-Time Estimation of the Effects of a Simulated Long-Duration Exploration Mission on Flight Performance, Workload, and Situation Awareness* [#17383]

This abstract discusses the project to integrate the existing Draper-developed configurable and portable simulation platform for use during the upcoming 45-day simulated long-duration space exploration missions (LDEMs) in the human exploration research analog (HERA).

Costa A. Anderson N.

*TEAM TRUST* [#17384]

The present research provides a review of the team trust literature that identifies key determinants relevant in the NASA context

Stahn A. Dinges D. Nasrini J. McGuire S. Hermosillo E. Ecker A. Kuehn S. Werner A. Brauns K. Gunga H. Moore T. Roalf D. Elliott M. Prabhakaran K. Gur R. Basner M.

*Hybrid Training - A Sensory Stimulation Countermeasure for Long Duration Space Exploration Missions* [#17385]

Hybrid Training investigates the effects of a sensory stimulation augmentation countermeasure combining physical exercise and virtual reality during a 1-year winter over missions in a high fidelity space analog in Antarctica on neurobehavioral measures.

Meirhaeghe N. Mélan C.

*EVALUATING THE EFFECTS OF MICROGRAVITY ON CREW COOPERATION IN AN ECOLOGICAL PERSPECTIVE-TAKING TASK: A PRELIMINARY STUDY* [#17386]

We present the preliminary results of a novel experiment meant to investigate for the first time the impact of microgravity on perspective-taking abilities in the context of realistic cooperative situations.

Holden K. Schreckenghost D. Greene M. Hamblin C. Morin L.

*ELECTRONIC PROCEDURES FOR CREWED MISSIONS BEYOND LOW EARTH ORBIT (LEO)* [#17387]

The abstract describes the first study in a series designed to investigate the impact of procedure design and automation on Situation Awareness.

Adelstein B. Ellis S.

*TELEOPERATION TARGETING MOVEMENTS IN THE PRESENCE OF CONTROL-DISPLAY MISALIGNMENT AND TIME DELAY: ANALYTIC MODELING* [#17388]

We developed analytic teleoperation models that relate rotational misalignments between controller and display frames of reference, system communication delays, and required task precision to the teleoperation performance expected for visually mediated manual targeting movements.

Bracken B. Palmon N. Irvin S. Jones C. Elkin-Frankston S. Strangman G. Farry M.  
*COGNITIVE ASSESSMENT AND PREDICTION TO PROMOTE INDIVIDUALIZED CAPABILITY AUGMENTATION AND REDUCE DECREMENT (CAPT PICARD)* [#17389]

Charles River Analytics and our collaborator at Massachusetts General Hospital designed and demonstrated a system for Cognitive Assessment and Prediction to Promote Individualized Capability Augmentation and Reduce Decrement (CAPT PICARD).

Rosen M. Dietz A. Kazi S. Sapirstein A. Rawat N. Pronovost P. Salas E. Oswald F.  
*DEVELOPING AND VALIDATING SENSOR-BASED MEASUREMENT STRATEGIES FOR TEAM MEMBER SELECTION* [#17390]

This abstract details a new project aimed at developing and validating a multi-level selection system for LDSE competencies incorporating traditional and unobtrusive sociometric measurement strategies.

Pagnini F. Phillips D. Langer E.

*Mindfulness, Recreation, and Relaxation for Exploration Missions* [#17391]

Mindfulness, relaxation training, and recreational activities are reportedly key for the prevention of distress and to maintain high performance over a long-duration exploration mission.

Dunn J. Landry S. Binsted K.

*TRAJECTORIES OF HEALTH AND STRESS IN LONG-DURATION MARS ANALOG CREWS* [#17392]

For the 8-month and 12-month missions of Hawaii Space Exploration Analog and Simulation (HI-SEAS), trajectories of health and stress in Mars analog crews are compared from biological, psychological, and behavioral perspectives with data from biosamples, questionnaires, and wearables.

Gonzalez A. Mahaffey B. Shim M. Hernandez J.

*REVIEW OF INTERNET-BASED BEHAVIORAL HEALTH INTERVENTIONS (IBHIs) FOR DEPRESSION AND ANXIETY DISORDERS AND THE ROLE OF HUMAN SUPPORT* [#17393]

This project summarized the evidence for IBHIs for the treatment of depression and anxiety; examined existing research on IBHIs with adjunctive human support versus completely self-guided; and identified commercial off-the-shelf-treatments for treatment of depression and anxiety.

Graber M. Shrestha M.

*COGNITIVE BIAS AND DECISION MAKING TRAINING* [#17394]

Education and training to improve decision making would benefit astronauts on future exploration class missions.

Zhang Q. Ikkovic V. Lockyer B. Strangman G.

*Sleep Electroencephalography and Near-Infrared Spectroscopy Measurements for Spaceflight and Analogs* [#17395]

NINscan-SE was successfully deployed in HERA Campaign 3, and upgraded based on operational lessons learned. The integrated PSG/NIRS system was favorably rated by the HERA crewmembers, and achieved TRL 6.

Roalf D. Prabhakaran K. Basner M. Dinges D. Stahn A. Nasrini J. McGuire S. Hermosillo E. Ecker A. Johannes B. Gerlach D. Gunga H. Melzer T. Taylor B. Elliott M. Bilker W. Gur R.

*Neurostructural, cognitive, and physiologic changes during a 1-year Antarctic winter-over mission* [#17396]

We report neuroimaging results of being in an isolated, confined, and extreme environment for prolonged periods of time show measurable changes in global and local brain structure(s)

Morie J. Wu P.

*LESSONS LEARNED FROM IMPLEMENTING A VIRTUAL WORLD ECOSYSTEM FOR A SIMULATED MARS CREW: THE ANSIBLE PROJECT IN THE HI-SEAS MARS HABITAT YEAR LONG MISSION* [#17397]

This report details the creation, deployment, maintenance, use and lessons learned concerning a virtual world ecosystem called ANSIBLE as it was used in a one year isolation Mars simulation mission recently concluded at the HI-SEAS Mars habitat in Hawaii.

Siu K. White A. Oleynikov D.

*Varied Surgical Simulation Training Schedules on Skills Acquisition in Space* [#17398]

This work on "training schedules" aims to address the effectiveness of teleoperational training regimen (massed, distributed and hybrid) on skills acquisition using virtual reality simulator in space.

Sebok A. Walters B. Plott C.

*The Integration of Human Centered Design Principles into the Agile Development Process for Safety- and Mission-Critical Systems* [#17399]

This presentation discusses best practices and lessons learned regarding the integration of the Agile development process and human centered design principles for the development of safety- and mission-critical systems.

Young K. Evans C. Bleacher J. Graff T. Zeigler R.

*Geoscience Training for NASA Astronaut Candidates* [#17400]

We describe the current geoscience training plan for all incoming NASA astronaut candidates as well as give an overview of training opportunities post-candidacy.

Anderson A. Cowan D. Fellows A. Binsted K. Hegel M. Buckey J.

*[Autonomous Behavioral Health Countermeasures \[#17401\]](#)*

Describes use of computer-based training and treatment modules, as well as virtual reality, for psychological support in isolated and confined environments

Young K. Graff T. Reagan M. Coan D. Evans C. Bleacher J. Glotch T.

*[Lessons Learned in Science Operations for Planetary Surface Exploration \[#17402\]](#)*

We describe past, current, and planned future work to develop new science operational concepts for planetary surface exploration.

Fiore S. Burke S. Salas E.

*[Integrating Research Approaches for Individual and Team Level Cognition in Long Distance Exploration Space Missions \[#17403\]](#)*

We propose an approach that unites the study of individual and team cognitive processes in order to enrich our understanding of team cognition in LDEM and develop and validate training protocols that lead to resilient team cognitive processes.

Miller M. Feigh K. McGuire K.

*[Decision Support System Development for Human Extravehicular Activity: Designing and testing within mars surface operational environments \[#17404\]](#)*

This cognitive systems engineering research presents work on (1) the design decision support system (DSS) extravehicular activity operations and (2) the develop a contextually relevant Mars simulation environment to conduct DSS software usability studies.

Goel N. Dennis L. Ecker A.

*[INDIVIDUAL DIFFERENCES IN NEUROBEHAVIORAL AND AFFECTIVE RESPONSES TO STRESS AND SLEEP LOSS IN 14-DAY AND 30-DAY HERA MISSION CREWMEMBERS \[#17405\]](#)*

Crewmembers show deficits and individual differences in neurobehavioral and affective responses to stress and sleep loss in HERA 14-day and 30-day missions.

Dixon A. Santoro J. Olenick J. Chang C. Kozlowski S.

*[AN INVESTIGATION INTO TEAM DYNAMICS WITHIN THE HUMAN EXPLORATION RESEARCH ANALOG \[#17406\]](#)*

Our research team has collected data from the three completed campaigns of HERA and we present data regarding the teams' dynamics.

Liu A. Galvan-Garza R. Yang Y. Oman C.

*[DESIGN AND AUTOMATION OF ELECTRONIC CHECKLISTS FOR ROBOTIC OPERATIONS \[#17407\]](#)*

We are developing a prototype electronic procedure system to study how automated step execution could be implemented to enhance situation awareness (SA), operator workload, and task execution in the context of robotic arm operation.

Hermosillo E. Dinges D. McGuire S. Nasrini J. Ecker A. Stahn A. Moore T. Gur R. Johannes B. Basner M.

*[Increasing administration order flexibility of the Cognition Test Battery for Spaceflight \[#17408\]](#)*

We are administering a study protocol that will inform any differences in practice effects depending on administration interval, with the goal of increasing the administration order flexibility of the Cognition Test Battery for Spaceflight



Fink P. James B. Kennedy T. Ngo P. Andrew C. Tucker K. Shenoy P. Diao Y. Cecchet E.

*RFID-Enabled Autonomous Logistics Management (REALM) Experiments* [#17409]

The presentation will address the REALM experiments to be performed on the International Space Station in 2017, as well as follow-on REALM experiments and related technology efforts.

Lockley S. Rahman S. St. Hilaire M. Flynn-Evans E. Barger L. Brainard G. Czeisler C. Klerman E.

*THE ISS DYNAMIC LIGHTING SCHEDULE: AN IN-FLIGHT LIGHTING COUNTERMEASURE TO FACILITATE CIRCADIAN ADAPTATION, IMPROVE SLEEP AND ENHANCE ALERTNESS AND PERFORMANCE ON THE INTERNATIONAL SPACE STATION* [#17410]

The data from this study will form the basis of operational lighting recommendations for use of the Solid State Lighting Assemblies (SSLA) aboard the ISS.

Iwig C. Dinh J. Stone E. Li W. Salas E.

*EVALUATION OF A WEB-BASED MEASUREMENT TOOLKIT FOR ADVISING THE ASSESSMENT OF HUMAN-AUTOMATION SYSTEM SAFETY AND PERFORMANCE* [#17411]

A prototype metrics toolkit has been completed; thus this abstract presents our current research efforts, which involve evaluation of this web-based toolkit on its usability and usefulness in laboratory studies using participants representative of potential end users.

Barger L. Sullivan J. Flynn-Evans E. Abercromby A. Limardo J. Alexander D. Norcross J. Wessel J. Wang W. Czeisler C.

*ENVIRONMENTAL FACTORS ASSOCIATED WITH SLEEP DEFICIENCY DURING SPACEFLIGHT* [#17412]

This project will perform secondary analyses to evaluate the association among sleep during spaceflight and various environmental variables.

Webb J. Olenick J. Ayton J. Chang C. Kozlowski S.

*AN EXAMINATION OF THE RELATIONSHIPS BETWEEN THE BIG FIVE PERSONALITY FACTORS AND TEAM PROCESSES* [#17413]

We present findings from individuals living in the Antarctic and provide insight into how personality factors influence team processes in isolated, confined, and extreme environments.

Beard B. Ohnesorge K. Whitmire A. Stuster J. Schuh S.

*Characterization of ISS Crew Members' Workload Contributing to Fatigue, Sleep Disruption and Circadian De-synchronization* [#17414]

The focus of this project is to characterize how the ISS crewmembers' workload may be contributing to sleep loss, circadian misalignment and fatigue.

Barger L. Sullivan J. Flynn-Evans E. Basner M. Dinges D. Seaton K. Wang W. Czeisler C.

*THE IMPACT OF OBJECTIVELY MEASURED SLEEP DEFICIENCY AND CIRCADIAN MISALIGNMENT ON PERFORMANCE DURING SPACEFLIGHT* [#17415]

This secondary analysis project will evaluate objective measures of sleep and performance during spaceflight.

Burke S. Salas E.

*FACILITATING THE SYNERGISTIC SIDE OF CULTURAL DIVERSITY IN LONG DURATION SPACE EXPLORATION* [#17416]

We describe the vision and initial efforts on a NASA funded project (that is currently in the definitional phase) to examine the impact of cultural diversity on LDSE crews and the subsequent training countermeasure that will be developed and tested.

Burke S. Shuffler M. Wiese C. Hernandez C. Flynn M.

*Shared Leadership in Isolated, Confined Environments (ICE) [#17417]*

We describe our findings regarding the nature of team leadership, with an emphasis on shared leadership, within the context of long duration space flight using data from an archival analysis and data collection within an analog environment.

Bell S. Vinokhodova A. Gushin V. Contractor N. DeChurch L.

*THE RELATIONSHIP BETWEEN COMPOSITION, INTERPERSONAL RELATIONS, AND TEAM EFFECTIVENESS [#17418]*

Our research integrates the US-based and Russian approaches to examining interpersonal compatibility in space teams. The development and empirical test of a process model of interpersonal relationship formation is central to our 3-year collaborative research program.

Dinges D. Metaxas D. Zhong L. Yu X. Wang L. Dennis L. Park-Chavar S. Carlin P. Ecker A. Yu A. Jones C. Basner M.

*OPTICAL COMPUTER RECOGNITION OF STRESS, AFFECT AND FATIGUE IN SPACE FLIGHT [#17419]*

This project sought to develop and refine an unobtrusive and objective optical computer recognition (OCR) machine vision technology that can track facial expressions in space flight and provide early detection of facial expressions of stress, negative moods and fatigue from sleep loss.

De Dios Y. Gadd N. Kofman I. Kreutzberg G. Peters B. Taylor L. Campbell D. Wood S. Bloomberg J. Seidler R. Mulavara A.

*BEHAVIORAL ASSESMENT OF SPACEFLIGHT EFFECTS ON NEUROCOGNITIVE PERFORMANCE EXTENT AND LONGEVITY [#17420]*

In consideration of the health and performance of crewmembers in- and post-flight, we are conducting this study to investigate the effects of spaceflight on the extent, longevity and neural bases of sensorimotor, cognitive, and neural changes.

Dennis L. Basner M. Strangman G. Stuster J. Mollicone D. Roma P. Williams T. Gur R. Stahn A. Ecker A. Nasrini J. Mott C. Dinges D.

*PSYCHOLOGICAL SELF-REPORT DATA IN HERA: A COMPONENT OF BEHAVIORAL CORE MEASURES (PREVIOUSLY SBMT) [#17421]*

The feasibility and acceptability of the BCM psychological self-report measures were evaluated in four 30-day missions in NASA's Human Exploration Research Analog (HERA; short-duration analog).

Rose R. Wu P. Zbozinek T. Foale M. Oftedal A. Chen B. Craske M.

*Asynchronous Behavioral Health Treatment Techniques for Long-duration Missions [#17422]*

Randomized controlled trial comparing the efficacy, feasibility, and acceptability of asynchronously delivered cognitive behavioral therapy to in-person therapy delivered via videoconference for symptoms of anxiety, depression, and stress.

Moore T. Basner M. Seelaus K. Nasrini J. Hermosillo E. McGuire S. Ecker A. Roalf D. Ruparel K. Jackson C. Port A. Dinges D. Gur R.

*Validation of the Cognition Test Battery for Spaceflight in a Sample of STEM Educated Adults, with Ongoing Follow-Up [#17423]*

We administered the Cognition Test Battery for Spaceflight to a group of highly educated adults for the purpose of validation; we are also bringing them back for a follow-up to assess practice effects and associations with neuroimaging.



Schreckenghost D. Billman D. Klerman E. Hambuchen K.

*Quantifying and Developing Countermeasures for the Effect of Fatigue-Related Stressors on Automation Use and Trust During Robotic Supervisory Control* [#17424]

Results are summarized from a study evaluating the effects of sleep deprivation on human performance when supervising robotic tasks, including the development of automation countermeasures.

Newby N. Somers J. Putnam J. Wells J.

*SOYUZ LANDING RISK CHARACTERIZATION* [#17425]

Abstract contains results from characterization of occupant safety risk of the Soyuz vehicle.

Nasrini J. Dinges D. McGuire S. Hermosillo E. Ecker A. Mollicone D. Mott C. Binsted K. Caldwell B. Moore T. Gur R. Basner M.

*COGNITIVE PERFORMANCE IN LONG-DURATION MARS SIMULATIONS AT THE HAWAII SPACE EXPLORATION ANALOG AND SIMULATION (HI-SEAS)* [#17426]

The Cognition test battery was evaluated for feasibility and time-in-mission effects in crew members of the Hawaii Space Exploration Analog and Simulation (HI-SEAS) long-duration simulations. The battery was administered during 4-, 8-, and 12-month HI-SEAS missions (total N=18).

Contractor N. Antone W. Gibson Z. Ng J. DeChurch L. Bell S.

*Building Extreme Teams: Simulating Team Composition Effects in Isolated and Confined Environments* [#17427]

Team composition effects on team interpersonal networks, in long-duration space exploration analog environments, are examined in order to develop an agent-based model for predicting team outcomes based off of team member characteristics and the traits of tasks being completed.

Nasrini J. Dinges D. McGuire S. Hermosillo E. Ecker A. Moore T. Gur R. Stevens B. Donoviel D. Mulder E. Bershad E. Basner M.

*EFFECTS OF 12-DEGREES HEAD-DOWN TILT WITH AND WITHOUT ELEVATED LEVELS OF CO2 ON COGNITIVE PERFORMANCE: THE SPACE-COT STUDY* [#17428]

The Cognition test battery was administered in a study looking at Physiological and Anatomical Cerebral Effects of Carbon Dioxide and Tilt (SPACE-COT) to N=6 healthy male subjects in 12° HDT, combined with both elevated (0.5%) and ambient CO2 conditions in a counterbalanced fashion.

Weiss J. Outland N. Bell S. DeChurch L. Contractor N.

*Interpersonal Compatibility in HERA 2016* [#17429]

This project explores the importance of team composition and interpersonal compatibility in regards to mission success, utilizing data collected in HERA's 2016 campaigns.

Williams T. Landon L. Vessey W. Schneiderman J. Seaton K. Stanley R. Kusmiesz C. Tisson J.

*WINSCAT VS COGNITION BATTERY: A STUDY TO VALIDATE AND ASSESS DIFFERENCES ACROSS TWO SPACEFLIGHT COGNITIVE ASSESSMENT TOOLS* [#17430]

We address the need for a validation study to compare WinSCAT to Cognition to validate the psychometric properties of both measures and develop norms using a military population with high demands similar to those experienced by astronauts (eg, deployments, isolation, extreme environments).

Shattuck N. Smith K. Matsangas P. Dahlman J.

*USE OF HYPNOTIC AND ALERTNESS MEDICATIONS (HAMS) IN THE U.S. MILITARY* [#17431]

This study focused on the lessons learned from the use of hypnotic and alertness medication in the military.

Plummer G. DeChurch L. Contractor N. Mesmer-Magnus J.

*THE COSTS OF SWITCHING BETWEEN TEAM AND MULTITEAM TASKS AND THE ROLE OF SHARED COGNITION* [#17432]

We look at how shared mental models impact an individual's ability to switch between tasks with varying levels of interdependence.

Billman D. Catrambone R. Feldman J. Martin R. Schreckenghost D.

*Training for Generalizable Skills & Knowledge: Integrating Principles and Procedures* [#17433]

Transfer of training is needed for future NASA missions and is investigated in a study of whether more integrated knowledge and skills can be produced and whether this affects transfer.

Contractor N. Gokhman I. Larson L. Bell S.

*Leadership Networks in Space Crews* [#17434]

We explore the role of expertise and personality in leadership emergence during four, 30 day analog space studies.

Binsted K. Basner M. Bedwell W. Bishop S. Caldwell B. Chang D. Hunter J. Kozlowski S. Roma P. Shiro B. Wu P.

*INVESTIGATIONS AT HI-SEAS INTO TEAM FUNCTION AND PERFORMANCE ON, AND CREW COMPOSITION FOR, LONG DURATION EXPLORATION MISSIONS* [#17435]

This is an overview of research conducted to date at HI-SEAS (Hawaii Space Exploration Analog and Simulation) and plans for the future.

Contractor N. DeChurch L. Park P.

*UNDERSTANDING ELECTIVE TASK SWITCHING* [#17436]

To mitigate the risks imposed by involuntary, scheduled task switches upon crew members, this project attempts to understand elective task switching behavior that could subsequently inform the development of effective task scheduling principles.

Weiss J. Outland N. Bell S. Contractor N. DeChurch L.

*INTERPERSONAL COMPATIBILITY IN HERA 2016* [#17437]

To inform our larger team composition models for LDSE, we explored our team composition data collected in HERA 2016 with the overarching purpose of identifying key themes likely to be related to the development of affective and hinderance ties, and team viability.

Zakhlebin I. Vinokhodova A. Gushin V. Bell S. DeChurch L. Contractor N.

*Influence of Interpersonal Perceptions on Team Structure in Long-Duration Space Exploration Missions* [#17438]

We investigate how interpersonal perceptions and psychological distance relate to crew member viability ratings. We use Exponential Random Graph models and SIENA to analyze importance of psychological distance ratings captured by PSPA test over typical structural network features.

Niler A. DeChurch L. Plummer G. Tanaka K. Contractor N.

*IMPACT OF SOCIAL CONNECTEDNESS, COMMUNICATION DELAY, AND SLEEP DEPRIVATION ON COGNITIVE NETWORK SIMILARITY IN ANALOG TEAMS* [#17439]

We examined three factors that likely affect the cognitive similarity ties of the crew and mission control (social connectedness, communication delays, and sleep deprivation) to understand how team cognition would be impacted by the duress of long-distance space exploration.

Vazquez M. Vinokhodova A. Gushin V. Bell S. DeChurch L. Contractor N.

*PREDICTING INTERPERSONAL COMPATIBILITY IN SPACE CONTEXT USING FSQCA* [#17440]

Using archival data from isolation chamber simulations, we use Fuzzy Set Qualitative Comparative Analysis to identify conditions (e.g., individual traits, individual states) that jointly predict the presence of network ties between crew members.

Antone W. Contractor N. Bell S. DeChurch L.

*Faulty Analysis: Analyzing the Validity of Different Faultline Measurement Algorithms for Long-Duration Space Exploration* [#17441]

Multiple methods of measuring faultlines are compared for isolated and confined environments: weightings of different faultline attributes are developed and virtual experiments are conducted, leading to the creation of an aggregate measure combining multiple faultline measures.

Outland N. Bell S. Contractor N. DeChurch L. Weiss J.

*DETERMINANTS OF TEAM VIABILITY OVER TIME: AN ERGM ANALYSIS* [#17442]

We examined the extent that individual differences (e.g. personality), network structural features (e.g., reciprocity), and social relationships (e.g., affective ties) influence the development of team viability over time. Data were collected in HERA and analyzed using ERGMs.

Kaushik L. Sangwan A. Yu C. Dubey H. Joglekar A. Hansen J.

*HUMAN BEHAVIOR AND PERFORMANCE ANALYSIS BASED ON SPOKEN LANGUAGE TECHNOLOGY ALGORITHMS* [#17443]

Speech signal contains diverse information about individual behavior and group interaction/dynamics. we propose to develop a system which uses various speech processing based algorithms to extract parameters in order to learn, model, and assess human behavior and performance.

Barshi I. Dempsey D.

*ISS BEST PRACTICES* [#17444]

Training our crew members for long duration Exploration Class missions will have to be qualitatively and quantitatively different from current training practices.

Dempsey D. Barshi I.

*THE EFFECTS OF LONG-DURATION SPACEFLIGHT ON TRAINING RETENTION AND TRANSFER* [#17445]

Training our crew members for long duration Exploration Class missions will have to maximize long-term retention and transfer of the trained skills.

McLaughlin A. Sandor A. Sprufera J. Pryor M.

*CREATING A TAXONOMY OF VARIABLES AFFECTING COGNITIVE AIDS VIA AN INVESTIGATION OF HYBRID AIDS* [#17446]

Onboard crewmembers, similarly to operators from other industries, complain about using current checklist-like procedures. Issues include procedures having too much or too little detail and poor usability.

Feigh K. Lanessie M. Ijtsma M. Pritchett A.

*OBJECTIVE FUNCTION ALLOCATION FOR HUMAN-ROBOTIC INTERACTION*  
[[#17447](#)]

As NASA moves toward human exploration in deep space, future missions require humans to work with a variety of robotic systems that require improved automated support [6].

**Tuesday, January 24, 2017**  
**Poster Session B: Informal Help Desk**  
**4:30 PM** **Exhibit Hall A**

4:30 PM Suborbital Flight Opportunities Help Desk [#17449]

**Tuesday, January 24, 2017**  
**Poster Session B: Informal Help Desk**  
**4:30 PM** **Exhibit Hall A**

4:30 PM      Technology Transfer [#17450]

**Tuesday, January 24, 2017**

**Poster Session B: Informal Statistics Helpdesk**

**4:30 PM**

**Exhibit Hall A**

Young M. Koslovsky M. Schaefer C. Feiveson A.

[\*INFORMAL STATISTICS HELPDESK\*](#) [\*#17451\*](#)

Come get some statistical advice or find a statistician to help on your next project.

Tuesday, January 24, 2017

Poster Session B: Mixed Topics

4:30 PM

Exhibit Hall A

Thomas D. Delaney M.

[\*CONTRIBUTIONS OF THE REPOSITORIES TO SPACE EXPLORATION RESEARCH\*](#) [#17452]

The workshop poster will highlight successful uses of archived medical and research data for retrospective studies.

Young L. Natapoff A. Greenberg J.

[\*THE HARVARD-MIT PHD PROGRAM IN BIOASTRONAUTICS\*](#) [#17453]

The PhD Program in Bioastronautics combines clinical, biomedical and space engineering courses and practical experience.

Thompson W. Byrd L. Yager R.

[\*The Process for the Recruitment and Medical Clearance of Test Subject\*](#) [#17454]

Test Subject Support (TSS) are responsible for providing Principle Investigators with medically qualified Test Subjects.

Wood A. French A. Leung D. Gage A. Lopez D. Maese C. Bardina J. McDermott W. Stewart H.

[\*NASA AMES LIFE SCIENCES DATA ARCHIVE INSTITUTIONAL SCIENTIFIC COLLECTION\*](#) [#17455]

The Ames Institutional Scientific Collection, or Ames Biobank, is host to flight biospecimens from the Space Shuttle and ISS programs that are curated and managed by the Ames Life Sciences Data Archive (ALSDA) and these biospecimens are available to researchers.

Ronca A. Lewis L. Staten B. Moyer E. Vizir V. Gompf H. Hoban-Higgins T. Fuller C.

[\*Advancing Translational Space Research Through Biospecimen Sharing: Amplified Impact of Studies Utilizing Analogue Space Platforms\*](#) [#17456]

Biospecimen Sharing Programs (BSPs) have been organized by NASA Ames Research Center since the 1960's with the goal of maximizing utilization and scientific return from rare, complex and costly spaceflight experiments.



Tuesday, January 24, 2017

Poster Session B: Physics

4:30 PM

Exhibit Hall A

Gaza R. Hussein H. Shelfer T. Murrow D. Waterman G. Milstein O.

*ASTRO RAD RADIATION PERSONAL PROTECTIVE EQUIPMENT: VALIDATION THROUGH PHANTOM MEASUREMENTS ON BOARD ORION EM-1* [#17457]

Present a collaborative effort between Lockheed Martin and StemRad Israel toward development of AstroRad radiation protection vest, and proposed experimental validation of its radiation protection benefit as part of an international dosimetry intercomparison on board Orion EM-1 flight.

Over S. Ford J.

*Solar Particle Event Exposure Risks for Future Missions within the Inner Heliosphere* [#17458]

From a new analysis of GOES solar particle events, acute radiation risks can be determined for human spaceflight outside of Earth orbit with adjustments made for different mission parameters such as timing within the solar cycle, shielding levels, and location in the heliosphere.

Lewis R. Collado-Vega Y. Pellish J. Pulkkinen A.

*A Holistic, Collaborative, System of Systems Approach for Viable Radiation Mitigation Solutions* [#17459]

Creating a System of Systems framework that will meet NASA's critical need to enable an integrated, multidisciplinary, end-to-end, systematic plan and strategy to mitigate radiation effects for deep space human missions.

Bahadori A.

*Variance Reduction Using HZETRN2015 for Solar Particle Event Transport: Response Function Comparison* [#17460]

NASA dose equivalent response functions calculated using HZETRN2015 and PHITS are compared to evaluate the feasibility of using HZETRN2015 to optimize source sampling in PHITS for simulations of solar particle event spectra.

De Jesus R. Braby L.

*Characteristics of High Reliability TEPCs for Long Term Space Missions.* [#17461]

The performance characteristics of a prototype ISS spherical proportional counter filled with propane gas at atmospheric pressure.

Zeitlin C. Hassler D. Semones E. Rios R. Leitgab M. Ehresmann B. Wimmer-Schweingruber R. Guo J.

*Comparisons of RAD Data from Mars and Low-Earth Orbit* [#17462]

Energetic particle data from MSL-RAD aboard the Curiosity rover on Mars are compared to data from the ISS-RAD Charged Particle Detector currently deployed in the USLab on ISS.

Hollerman W.

*Testing Innovative Radiation Sensors During the CAPE 3 CubSat Mission* [#17463]

This presentation gives an overview of an innovative space radiation detection concept for an upcoming CubeSat mission.

Lee K. Barzilla J.

*A DOSE OF REALITY: RADIATION ANALYSIS FOR REALISTIC HUMAN SPACECRAFT* [#17464]

The work presented here demonstrates the use of the DAGMC (Direct Accelerated Geometry for Monte Carlo) Toolkit from the University of Wisconsin to model the impacts of several space radiation sources on a CAD drawing of the US Lab module

Hu S.

*A comparative modeling study on intestinal crypt dynamics of steady state and after radiation* [#17465]

The crypt dynamics for the small intestinal of BDF1 mice was investigated comparatively with two sets of mathematical models.

Ponomarev A. Plante I.

*CALCULATION OF DELETION, INVERSION, AND RING SPECTRA USING A COMPUTATIONAL MODEL OF THE RADIATION-INDUCED CHROMOSOME ABERRATIONS WITH STOCHASTIC AND AMORPHOUS PARTICLE TRACKS* [#17466]

Chromosome aberrations studies by a mechanistic model

Ponomarev A. Plante I. Hada M.

*SIMULATION OF DNA DAMAGE FROM GALACTIC COSMIC RAYS AND MIXED FIELDS AT VARIOUS DOSE-RATES* [#17467]

Simulation of radiation transfer through matter for space particles for a variety of ion types and energies, i.e. the mixed field approach.

Zeitlin C. Schwadron N. Wilson J. Jordan A. Spence H. Looper M. Farrell W.

*RECENT RESULTS FROM THE CReTER INVESTIGATION ON THE LUNAR RECONNAISSANCE ORBITER* [#17468]

We will update results on solar modulation of GCRs and present albedo proton measurements, the flux of which peaks near the lunar poles with a latitudinal distribution anti-correlated with neutron distributions; the data imply the presence of a thin hydrated layer near the surface.

Kidane Y.

*Meta-analysis of Transcriptional Datasets to Characterize Biological Responses to Ionizing Radiation* [#17469]

The study focus on a comprehensive analysis of gene expression data sets in order to identify transcriptional signatures of ionizing radiation that are prevalent across various experimental conditions.

La Tessa C. Giraudo M. Lobascio C. Norbury J. Rovituso M. Schuy C. Weber U. Bocchini L. Santin G. Duarte M.

*INNOVATIVE SHIELDING MATERIALS FOR RADIOPROTECTION IN SPACE* [#17470]

Passive shielding remains the simplest countermeasure for space radiation exposure in long-term space missions. Furthermore, for a permanent human base on the Moon or Mars, in-situ materials represent the most suitable choice due to their abundance.

Tuesday, January 24, 2017

Poster Session B: Space Radiation Cancer

4:30 PM

Exhibit Hall A

Lu T.

*Modeling Space Radiation with Radiomimetic Agent Bleomycin* [#17471]

With our recent findings in bleomycin-induced DNA damage and cellular responses, I propose that this radiomimetic agent could be used to mimic space radiation for studying its biological effects in living cells and animals and for countermeasure development.

Hada M. Rhone J. Slaba T. Saganti P.

*CHROMOSOME ABERRATIONS INDUCED BY ACUTE AND CHRONIC DOSE RATE MIX FIELD EXPOSURE* [#17472]

Chromosome aberration was compared with acute and chronic exposure of mixed beam.

Ray F. Fallgren C. Garcia E. Weil M.

*DEVELOPMENT OF A MOUSE-SPECIFIC INVERSION ASSAY FOR BIODOSIMETRY* [#17473]

We have developed chromatid paint probes for mouse chromosomes 1-4 and intend to demonstrate their utility for biodosimetry.

Zhou D. Chang J. Shao L. Wang Y. Mao X. Nelson G. Boerma M. Sridharan V. Singh P. Cao M. Hauer-Jensen M.

*Whole body proton irradiation causes acute damage to hematopoietic stem cells in mice* [#17474]

Whole body proton irradiation causes acute damage to hematopoietic stem cells in mice.

Soucy P. O'Toole M. Nunn B. Lanceta L. Decarlo A. Pack L. Eaton J. Ehringer W. Keynton R.

*Drug Delivery of Antioxidants for Mitigation of Fe56 Radiation Induced Cell and tissue Damage in Mice* [#17475]

The objective of the current study was to evaluate the effectiveness of our three drug delivery systems in mitigating radiation induced damage in mice exposed to Fe56 radiation.

Kim S. Luitel K. Barron S. Richardson J. Fornace A. Jerry S.

*Simulated Solar Particle Events (SPE) Promotes Senescence-Associated Inflammatory Responses in Colorectal Cancer Susceptible Mouse Model* [#17476]

Exposure to SPE irradiation elicits significant changes in colorectal cancer initiation and progression that can be protected by CDDO-EA pretreatment.

Aravindan N. Aravindan S. Natarajan M.

*Oncogene addiction driven radiogenic transformation of Normal Tissue after HZE Radiation* [#17477]

This study, while reporting novel findings on radiogenic transformation of normal tissue when exposed to particle radiation, it also provides a platform for further investigation into different radiation quality, LET and dose/dose rate effect in healthy organs.

Barnette B. Strain S. Licht C. Yongjia Y. Ullrich R. Emmett M.

*An Integrated Omics Approach to the Study of Hepatocellular Carcinoma (HCC) Induced by Low Dose, High-Energy, High Charge Ions (HZE) [#17478]*

An Integrated Omics Approach encompassing global lipidomics, RNA-sequencing, and targeted proteomics is being utilized to determine the molecular pathways that ultimately lead to the promotion and progression of hepatocellular carcinoma induced by low dose, high-energy, high charge ions.

Milder C. Elgart S. Chappell L. Charvat J. Huff J. Semones E. Van Baalen M.

*Cancer Risk in Astronauts: A Constellation of Uncommon Consequences [#17479]*

This work describes the obstacles in studying cancer risk among astronauts and identifies the first seven NASA astronaut selection groups as a potential cohort to study this risk.

Luitel K.

*INVESTIGATING LUNG CANCER DUE RISK TO SOLAR P SOLAR PARTICLE EVENT [#17480]*

A better understanding of the mechanistic details of radiation-induced tumorigenesis may lead to identification of novel radioprotective measures.

Kumar S. Suman S. Moon B. Fornace Jr A. Datta K.

*Adverse effects of radiation on murine intestinal epithelial cell migration is dependent on radiation quality [#17481]*

Low dose Heavy ion radiation <sup>56</sup>Fe perturbs intestinal epithelial migration 60 days after exposure in mouse model.

Meltzer P. Xu L. Kim S. Shay J. Fornace Jr. A.

*Genome Abnormalities in Space Radiation Driven Gastrointestinal Carcinogenesis [#17482]*

Under the auspices of the GI-NSCOR program, we are using integrative genomics to identify the signatures of space radiation exposure tumorigenesis and the mechanistic consequences of these disturbances to support risk assessment and mitigation strategies.

Kumar S. Datta K. Suman S. Fornace A.

*Space radiation exposure persistently increased leptin and IGF1 in serum and activated leptin-IGF1 signaling axis in mouse intestine [#17483]*

Heavy ion radiation upregulated IGF1/leptin signaling axis with implications for increased risk for metabolic alterations and cancer in the GI tract during/after long duration space missions.

Kronenberg A. Gauny S. Grossi G. Lee J. Weber S. Grygoryev D. Turker M. Raber J.

*GCR SIMULATION STUDIES WITH HUMAN AND MOUSE MODELS [#17484]*

This project is evaluating the biological effects of exposure to components of the galactic cosmic radiation, with the current focus on the effects of He ions and a suite of in vitro and in vivo endpoints.

Lu T.

*Detection of DNA damage by space radiation in human fibroblasts flown on the International Space Station [#17485]*

Gamma H2AX foci detected in human fibroblasts flown on the International Space Station may be caused by high-LET space radiation.

Costes S. Guet E. Degorre C. Snijders A.

*SKIN-based DNA repair phenotype for cancer risk from GCR in genetically diverse populations [#17486]*

The role of genetic diversity in space risk assessment

Wu H.

*DEPENDENCE OF EARLY AND LATE CHROMOSOMAL ABERRATIONS ON RADIATION QUALITY AND CELL TYPES* [#17487]

The RBE values for early and late chromosome aberrations are dependent on the time points, cell types and genetic background.

Pluth J. Sridharan D. Enerio S. Narasimhan R. Wang C. To J. Stampfer M. Garbe J.

*Influence of age and radiation quality on protein expression and genomic instability* [#17488]

The age and radiation quality dependency on genomic stability and stress pathway protein expression are being investigated in primary human mammary epithelial strains.

Burma S. Todorova P. Mukherjee B. Guida P. Story M.

*MECHANISTIC ANALYSIS OF PARTICLE RADIATION-INDUCED CARCINOGENESIS USING VALIDATED MOUSE GLIOMA MODELS* [#17489]

Using validated mouse glioma models, we are estimating the tumorigenic potential of a range of charged particles representing the space radiation environment, and are developing a mechanistic understanding of the process of charged particle-induced carcinogenesis.

Ding L. Hwang T. Park S. Edmondson E. Yu Y. Ullrich R. Weil M. Story M.

*GENOMICS ANALYSIS OF LOW AND HIGH LET RADIATION-INDUCED HEPATOCELLULAR CARCINOMA IN A MOUSE MODEL* [#17490]

Genomics analysis identified gene expression changes and DNA fusion associated with radiation-induced murine HCC

Chappell L. Elgart S. Shavers M. Milder C. Semones E. Huff J.

*MIND THE GAP: EXPLORING THE UNDERGROUND OF THE NASA SPACE CANCER RISK MODEL* [#17491]

This work outlines the NSCR-2012 model for radiation-induced cancer risk, identifying knowledge gaps where future research could make an impact in model improvement.

Bachri A. Pathak R. Ghosh S. Koturbash I. Boerma M. Binz R. Sawyer J. Hauer-Jensen M.

*THE VITAMIN E ANALOG GAMMA-TOCOTRIENOL (GT3) SUPPRESSES RADIATION-INDUCED CYTOGENETIC DAMAGE* [#17492]

Ionizing radiation (IR) generates reactive oxygen species (ROS), which cause DNA double-strand breaks (DSBs) that are responsible for cytogenetic alterations.

Cornforth M.

*Molecular characterization of transmissible chromosome aberrations produced by ions of intermediate and high atomic number* [#17532]

We endeavor to ultimately sequence the breakpoint junctions of chromosome exchange-type aberrations produced by exposure to gamma rays, Li-7 and Fe-56 ions.

Blakely E. Chang P. Mao J. Bakke J. Grover A. Rusek A. La Tessa C. Snyder D.

Bjornstad K. Sachs R.

*PREDICTING AND SIMULATING GCR-INDUCED TUMOR RISK* [#17338]

Without available human epidemiological data on space radiation-induced tumorigenesis, uncertainties remain regarding the evaluation of cancer risk to manned space crews from exposure to space radiations in transit to, as well as in orbit around Mars, or on its surface.

Wednesday, January 25, 2017

Exploration Medical Capability Technology Development

8:00 AM

Galleon I

Chairs: Sam Hussey and Kelly Gilkey

- 8:00 AM Mela C. Thompson W. Papay F. Liu Y.  
[\*MULTIMODAL IMAGING PLATFORMS FOR MEDICAL DIAGNOSTICS AND INTERVENTIONS IN SPACE\*](#) **[#17104]**  
The long-term health of astronauts in space relies on effective in-situ diagnoses, management and interventions. However, clinicians are not typically present during space exploration.
- 8:15 AM Eaton M. Hellmer R.  
[\*Multi-Purpose X-ray Source and System for Exploration Medical Condition Imaging\*](#) **[#17105]**  
A Multi-Purpose X-ray Source and System (MPXS) is being developed for use on flight missions, space stations, and planetary bases, to meet nearly all NASA imaging needs detailed in the Exploration Medical Condition List (EMCL).
- 8:30 AM Nelson E. Hussey S.  
[\*Evaluation of portable biomedical diagnostic capabilities for spaceflight\*](#) **[#17106]**  
We evaluated innovative devices created by two companies under SBIR contracts funded by Exploration Medical Capability as candidates for production of a flight-ready blood analyzer to be used in a technology demonstration on the International Space Station in or after 2018.
- 8:45 AM Bleacher J. Hurowtiz J. Rogers D. DiFrancesco N. McAdam A. Stern J. Young K. Glotch T. Nekvasil H.  
[\*EXPLORING THE GEOCHEMISTRY, TOXICITY AND FATE OF FUMAROLIC DEPOSITS IN PLANETARY ANALOGUE TERRAINS\*](#) **[#17107]**  
We will discuss our research related to the toxicity of materials associated with high value science targets such as fumaroles.
- 9:00 AM Hendrix D. Hurowitz J.  
[\*MEASUREMENT OF THE HYDROXYL RADICAL GENERATION OF POWDERED MINERALS ANALAGOUS TO THOSE ON THE LUNAR SURFACE\*](#) **[#17108]**  
Assessment of the chemical radicals generated after powdered minerals analogous to those found on the lunar surface are exposed to aqueous solutions.
- 9:15 AM Hurowitz J. Schoonen M. Glotch T. Bleacher J.  
[\*AN OVERVIEW OF SOME REGOLITH CHEMICAL AND MINERALOGICAL PROPERTIES RELEVANT TO PROTECTING ASTRONAUT HEALTH ON THE MOON AND MARS\*](#) **[#17109]**  
An overview and comparison of the chemical and mineralogical properties of regolith on airless planetary bodies and Mars, with a focus on the human health hazards that may be posed by exposure to fine-grained respirable dusts.
- 9:30 AM Break **[#17110]**

Wednesday, January 25, 2017

Exploration Monitoring Tools I

8:00 AM

Galleon II & III

**Chairs:** Thomas Williams and Kristine Ohnesorge

- 8:00 AM Dinges D. Basner M. Strangman G. Stuster J. Mollicone D. Roma P. Gur R. Stahn A. Dennis L. Ecker A. Nasrini J. Mott C. Williams T.  
[BEHAVIORAL CORE MEASURES \(PREVIOUSLY SBMT\): OVERVIEW OF DATA COLLECTION IN HERA 30-DAY MISSIONS \[#17125\]](#)  
The goal of this project is to develop a standardized suite of behavioral health core measurement tools that would be feasible to implement within the constraints of spaceflight research, in ground-based analogs and prolonged missions in isolated, confined, extreme (ICE) environments.
- 8:25 AM Basner M. Dinges D. McGuire S. Nasrini J. Hermosillo E. Ecker A. Mollicone D. Mott C. Port A. Moore T. Gur R.  
[Update on the development and validation of the Cognition test battery for spaceflight \[#17126\]](#)  
Cognition is a neuropsychological test battery specifically designed for the astronaut population and currently deployed in >20 research studies. Results of the latest validation efforts will be reported.
- 8:50 AM Ivkovic V. Alexander D. Cefaratti D. Sommers B. Dinges D. Strangman G.  
[Behavioral Core Measures: ROBoT Task Performance \[#17127\]](#)  
We are adapting the Robotics On-Board Trainer (ROBoT) system for CanadArm2 operation to be used as an operationally-relevant performance assessment tool as part of the Behavioral Core Measures project.
- 9:15 AM Discussion [#17128]
- 9:30 AM Break [#17129]



Wednesday, January 25, 2017

Physics I

8:00 AM

Hilton Crystal Ballroom

**Chairs:** John Norbury and Lawrence Heilbronn

- 8:00 AM Norbury J. Blattnig S. Slaba T. Werneth C. Norman R. Cloudsley M. Aghara S. Badavi F. Maung K. Miller J. Townsend L. Tweed J. Wilson J. Zeitlin C.  
[HIGH IMPACT NEW DISCOVERIES FROM PHASE 2 PHYSICS PROJECT \[#17232\]](#)  
Important new discoveries in space radiation physics and transport are discussed.
- 8:15 AM Norbury J. Slaba T. Beach M. Heilbronn L. La Tessa C. Zeitlin C.  
[HIGH PRIORITY NEEDS FOR FUTURE CROSS SECTION MEASUREMENTS \[#17233\]](#)  
The cross section measurement program at NSRL is described.
- 8:30 AM Srikrishna A. Castellanos L. McGill N. Heilbronn L. LaTessa C. Rusek A. Sivertz M. Beach M. Blattnig S. Cloudsley M. Norbury J. Slaba T. Norman R. Werneth C. Zeitlin C.  
[LIGHT FRAGMENT MEASUREMENTS RELEVANT TO SPACE RADIATION CALCULATIONS \[#17234\]](#)  
The aim is to produce double differential thick target yields for the production of neutrons, protons, deuterons, tritons,  $^3\text{He}$ , and  $^4\text{He}$  from intermediate heavy-ion interactions on aluminum, polyethylene and other targets of interest to the radiation shielding program as specified by NASA.
- 8:45 AM Castellanos L.  
[TRANSPORT CODE COMPARISONS TO ACCELERATOR MEASUREMENTS RELEVANT TO SHIELDING CALCULATIONS \[#17235\]](#)  
Comparisons of experimentally measured light ion and neutron yields compared with similar quantities calculated by Monte Carlo radiation transport codes.
- 9:00 AM Beach M. Heilbronn L. La Tessa C. Zeitlin C. Norbury J.  
[LIGHT ION DOUBLE DIFFERENTIAL CROSS SECTION MEASUREMENTS OF 300 MEV/N OXYGEN ON AN ALUMINUM TARGET \[#17236\]](#)  
Results and limitations of recent cross section measurements performed at the NASA Space Radiation Laboratory located at Brookhaven National Lab.
- 9:15 AM Discussion [\[#17237\]](#)
- 9:30 AM Break [\[#17238\]](#)



Wednesday, January 25, 2017

Radiation Effects on Affairs of the Heart I

8:00 AM

Yacht

Chair: Zarana Patel

- 8:00 AM Patel Z.  
*OVERVIEW OF THE “DEGEN” RISK OF CARDIOVASCULAR DISEASE AND OTHER DEGENERATIVE TISSUE EFFECTS FROM RADIATION EXPOSURE [#17500]*  
Degenerative tissue (non-cancer or non-central nervous system) effects, such as cardiovascular disease, cataracts, and digestive and respiratory diseases, are documented following exposures to terrestrial sources of ionizing radiation (e.g., gamma rays and x-rays).
- 8:10 AM Little M.  
*Cardiovascular effects at moderate and low ionizing radiation doses, and effects of high LET radiation exposure [#17501]*  
There have been many epidemiological studies, extending over a considerable period, documenting excess cardiovascular risk associated with high dose (> 5 Gy) radiotherapeutic exposure to low LET radiation, in particular after treatment for Hodgkin's disease and breast cancer.
- 8:35 AM Charitakis K.  
*Radiation-Induced CVD Risk in the Clinical Setting [#17502]*  
The cardiovascular effects of radiation were initially observed in atomic bomb survivors. Today, we observe these effects in patients with therapeutic radiation treatment for medical purposes as radiation therapy (RT) is received by over 50% of cancer patients
- 9:00 AM Atkinson M.  
*CONCERT: LOW DOSE RADIATION RESEARCH IN EUROPE WITH A FOCUS ON CARDIOVASCULAR DISEASE [#17503]*  
An overview of the CONCERT research consortium in Europe will given, including descriptions of MELODI and current or planned work packages related to radiation-induced cardiovascular disease.
- 9:25 AM Discussion [#17504]
- 9:30 AM Break [#17505]

Wednesday, January 25, 2017

Visual Impairment and Intracranial Pressure Update

8:00 AM

Grand Ballroom

**Chairs:** Bill Tarver and Michael Stenger

- 8:00 AM Tarver W.  
[VIIP 2017 CLINICAL UPDATE \[#17599\]](#)  
NASA's space medicine community knowledge regarding "Vision Impairment Intracranial Pressure", or VIIP, has been evolving over time.
- 8:23 AM Otto C. Ploutz-Snyder R. Sargysan A. Alexander D. Kramer L. Riascos R. Samuels B. Gibson C. Patel N. Lee S. Macias B.  
[Prospective Observational Study of Ocular Health in ISS Crews – The Ocular Health study \[#17600\]](#)  
The Visual Impairment Intracranial Pressure (VIIP) syndrome causes anatomic and functional alterations to the vision system.
- 8:46 AM Stenger M. Hargens A. Dulchavsky S. Arbeille P. Danielson R. Ebert D. Garcia K. Johnston S. Laurie S. Lee S. Liu J. Macias B. Martin D. Minkoff L. Ploutz-Snyder R. Ribeiro L. Sargsyan A. Smith S.  
[FLUID SHIFTS \[#17601\]](#)  
The purpose of this experiment is to characterize fluid distribution and compartmentalization associated with long-duration spaceflight and to determine if a relationship exists with ocular structure and function changes.
- 9:08 AM VanBaalen M. Tafreshi A. Patel N. Young M. Mason S. Otto C. Samuels B. Koslovsky M. Schaefer C. Taiym W. Wear M. Gibson C. Tarver W.  
[OCT Expanded Clinical Data Analysis \[#17602\]](#)  
NASA is collaborating with Heidelberg Engineering to expand our current OCT data analysis capability by implementing a volumetric approach, which may provide additional information about the optic nerve and further characterize changes related to microgravity exposure.
- 9:30 AM Break [\[#17603\]](#)

Wednesday, January 25, 2017

Exploration Medical Capability Collaborators

9:45 AM

Galleon I

**Chairs:** Erik Antonsen and Baraquiel Reyna

- 9:45 AM Latorella K. Wassenberg A. Simon M. Thaxton S.  
[LONG DURATION SPACE EXPLORATION MEDICAL WORKSTATION LAYOUT](#)  
[\[#17069\]](#)  
This effort focuses on habitat design considerations to ensure proper medical care, in consideration of the conditions that astronauts will encounter and the impact of these on experienced medical conditions.
- 10:00 AM Kempes C. Tracey B. Garland J.  
[PRELIMINARY INVESTIGATIONS OF THE DYNAMICS AND PREDICTION OF BLOODPRESSURE AND HEARTRATE STATISTICS IN A FRACTAL VASCULAR NETWORK](#)  
[\[#17070\]](#)  
We will present preliminary results for the dynamics and statistics of blood flow, heart rate, and blood pressure within a fractal vascular network.
- 10:15 AM Mcguire K.  
[Baylor Global Health](#) [\[#17071\]](#)  
Human Research Program's Exploration Medical Capability (ExMC) Element is working with Baylor College of Medicine to investigate infrastructure and potential technologies associated with treatment and emergency settings in remote locations.
- 10:30 AM Krihak M. Wolfe S. Lindsey T. Middour C. Toscano B. Winther S. Marker N. Shaw T.  
[Biosensor Integration Development ExMC/Canadian Space Agency Collaboration](#)  
[\[#17073\]](#)  
Mission risks and technology gaps for human spaceflight can be partially addressed through the collaboration of technical and human factors disciplines in the context of an integrated ground test environment.
- 10:45 AM Discussion [\[#17074\]](#)
- 11:15 AM Break [\[#17075\]](#)

Wednesday, January 25, 2017

Exploration Monitoring Tools II

9:45 AM

Galleon II & III

**Chairs:** Jason Schneiderman and Steve Stranges

- 9:45 AM Mollicone D. Kan K. Unice A. Coats S. Mott C.  
[Development and validation of STAR Watch \[#17130\]](#)  
This project will complete development and validation of Star Watch to provide a highly configurable actigraphy device to monitor astronaut sleep quantity, sleep quality, and ambient light levels.
- 10:10 AM DeChurch L. Schultz M. Johnson J. Contractor N. Mesmer-Magnus J. Plummer G. Twyman M.  
[STRUCTURED TEXT ANALYSIS FOR EVALUATING SHARED COGNITION \[#17131\]](#)  
We develop and validate a method for evaluating shared cognition within and between teams using transcripts of communications and discussions.
- 10:35 AM Williams T. Landon L. Vessey W. Schneiderman J. Basner M.  
[DEVELOPING BEHAVIORAL HEALTH AND PERFORMANCE STANDARD MEASURES FOR THE TEAM, SLEEP, AND BEHAVIORAL MEDICINE \(BMED\) RISKS \[#17132\]](#)  
BHP will inform the HRP Standard Measures with a suite of measures spanning the 3 BHP Risks: Team, Sleep, and Behavioral Medicine (BMed).
- 11:00 AM Discussion [\[#17133\]](#)
- 11:15 AM Break [\[#17134\]](#)

Wednesday, January 25, 2017

Physics II

9:45 AM

Hilton Crystal Ballroom

**Chairs:** John Norbury and Lawrence Heilbronn

- 9:45 AM      Badavi F. Xu X. Slaba T. Cloudsley M.  
*A model for the Low Earth Orbit secondary proton environment based on the Alpha Magnetic Spectrometer 1 (AMS-1) measurements* [#17239]  
Improving the radiation environment at LEO
- 10:00 AM      Townsend L. de Wet W. Ford W. Werneth C. Norman R.  
*Improved ablation stage modeling of HZE particle fragmentation* [#17240]  
This talk focuses on improvements to the recently-modified evaporation code, EVA, used to describe the ablation stage of HZE particle fragmentation collisions.
- 10:15 AM      de Wet W. Townsend L. Werneth C. Norman R. Ford W.  
*IMPROVED COALESCENCE MODELING OF LIGHT ION PRODUCTION FROM HZE PARTICLE INTERACTIONS* [#17241]  
Light ion production cross-section results for reactions representative of the space radiation environment are compared with experimentally measured values.
- 10:30 AM      Plante I. Brogan J. Borak T.  
*The distribution of energy deposition in tissue equivalent proportional counters: theoretical models and Monte-Carlo simulations.* [#17242]  
Calculations of the distribution of energy deposition in tissue equivalent proportional counters.
- 10:45 AM      Discussion [#17243]
- 11:15 AM      Break [#17244]

Wednesday, January 25, 2017

Radiation Effects on Affairs of the Heart II

9:45 AM

Yacht

**Chairs:** Zarana Patel and Marjan Boerma

- 9:45 AM Boerma M.  
*Center for Research on Cardiac and Vascular Effects of Space Radiation (Degenerative Risk Studies) [#17506]*  
This presentation describes the most recent studies on degenerative tissue effects as performed by the Center for Space Radiation Research.
- 10:30 AM Baker J. Lenarczyk M. Moulder J. Little M. Hopewell J. Kronenberg A.  
*DETERMINATION OF RISK FOR AND OCCURRENCE OF HEART DISEASE FROM SPACE RADIATION [#17507]*  
We are determining the increased risk for developing degenerative cardiac disease as a result of exposure to representative components of space radiation.
- 10:45 AM Kabarowski J. Barnes S. Gupta K. Walters K. Wilson L. Kucik D.  
*Space-relevant Doses of Heavy-ion Radiation Alter the Lipid Composition of Mouse Aortae, with Potential Consequences for Radiation-induced Atherosclerosis [#17508]*  
Heavy-ion radiation causes changes in aortic lipids that may be pro-atherogenic.
- 11:00 AM Sadek H. Aroumougame A.  
*RADIATION TRIGGERS CARDIAC HYPERTROPHY [#17509]*  
Understanding the molecular mechanisms that mediate delayed cardiomyopathy years after exposure to radiation is important for designing future preventative and therapeutic strategies.
- 11:15 AM Break [#17510]

Wednesday, January 25, 2017

Spaceflight and the Brain

9:45 AM

Grand Ballroom

**Chairs:** Michael Stenger and Christian Otto

- 9:45 AM Riascos R. Hasan K. Arash K. Mwangi B. Behzad B. Hakimelahi R. Sargsyan A. Kramer L.  
*Longitudinal Analysis of Quantitative Brain MRI in Astronauts Following Microgravity Exposure* [#17541]  
To retrospectively analyze data acquired on astronauts pre and post flight to help identify quantitative Magnetic Resonance Imaging (qMRI) changes in visual system
- 10:03 AM Alperin N. Lee S. Lam B. Bagci A.  
*THE ROLE OF CSF and ICP IN SPACEFLIGHT-INDUCED OCULAR DEFORMATIONS AND VISUAL IMPAIRMENT* [#17542]  
Flattening of the posterior sclera and protrusion of the optic nerve are among the hallmark signs of the visual impairment intracranial pressure (VIIP) syndrome reported in many ISS astronauts.
- 10:21 AM Roberts D.  
*Cephalad Migration of the Human brain due to altered gravity* [#17543]  
Here we demonstrated structural brain changes due to altered gravity.
- 10:39 AM Zanello S. Stevens B. Calvillo E. Bershad E. Tadigotla V. Skog J.  
*CSF AND PLASMA GENE EXPRESSION PROFILES IN INTRACRANIAL HYPERTENSION* [#17544]  
This work reports gene expression profiling of exosomal RNA from CSF and plasma to address the impact of intracranial pressure on brain physiology and the pathophysiology of ICP increase.
- 10:57 AM Kramer L. Hasan K. Bershad E. Wittweger J. Marshall-Goebel K. Donoviel D.  
*Cerebrovascular and Intracranial Effects of 12 degree Head-Down Tilt and Hypercapnia: A Preliminary Study using Phase-contrast and Volumetric MR Imaging* [#17545]  
Hypercarbia and head down tilt work synergistically to increase CSF pulsatility, which may represent a new paradigm in the pathophysiology of the visual impairment syndrome in astronauts.
- 11:15 AM Break [#17546]

Wednesday, January 25, 2017

Communication: The Omics of Sports and Space

1:00 PM

Galleon II & III

**Chairs:** Chuck Lloyd and Laurie Abadie

1:00 PM

Abadie L. Lloyd C.

*THE OMICS OF SPORTS & SPACE HOW GENOMICS IS TRANSFORMING BOTH FIELDS* [\[#17041\]](#)

Join top 10 New York Times Bestseller “The Sports Gene” author David Epstein and NASA Twins Study investigator Christopher E. Mason, Ph.D., in the debate as old as physical competition—nature versus nurture.

2:30 PM

Break



Wednesday, January 25, 2017

Exploration Medical Capability Technology Development: Imaging Technologies

1:00 PM

Galleon I

**Chairs:** Sam Hussey and Kelly Gilkey

- 1:00 PM Bailey M.  
[\*A phantom and test bed to enhance kidney stone comminution by therapeutic ultrasound\*](#) **[#17111]**  
We are developing ultrasound technology to image, break, and reposition urinary stones.
- 1:15 PM Chan H. Thompson W. Zoldak J. Eustace J. Wall K.  
[\*FLEXIBLE ULTRASOUND SYSTEM FOR EXPLORATION AND HUMAN RESEARCH – COUNTDOWN TO DELIVERY\*](#) **[#17112]**  
The Flexible Ultrasound System (FUS) ground demo units have been delivered to NASA and research partners have begun working with the FUS Software Development Kit (SDK) to implement advanced ultrasound algorithms that will reduce medical risk for astronauts on deep space missions.
- 1:30 PM Qin Y. Liu J. Zhang T. Li X.  
[\*Bone Fracture and Critical Defect Healing by Guided Low-Intensity Ultrasound\*](#) **[#17113]**  
Low-intensity ultrasound induced acoustic radiation force can generate local therapeutic signals in fracture and critical defects to significantly increase new trabecular bone volume, mechanical stiffness and ultimate strength, and ultimately accelerate healing and bone regeneration.
- 1:45 PM Dentinger A. Ebert D. Garcia K. Sargsyan A.  
[\*Tissue Doppler Ultrasound for Assessing Intracranial Dynamics\*](#) **[#17114]**  
A new ultrasound measurement method for assessing intracranial dynamics based on tissue Doppler imaging is explored and the feasibility tested in an elevated intracranial pressure animal study.
- 2:00 PM Simon J. Cunitz B. Sapozhnikov O. Wang Y. Dunmire B. Thiel J. Starr F. Holm J. Bailey M.  
[\*THE EFFECT OF RESPIRATORY GAS COMPOSITION AND PRESSURE ON KIDNEY STONE DETECTION WITH THE ULTRASOUND TWINKLING ARTIFACT\*](#) **[#17115]**  
The color Doppler ultrasound twinkling artifact, which highlights kidney stones with rapidly changing color, is reduced by elevated levels of carbon dioxide or elevated pressure and is increased by elevated levels of oxygen.
- 2:15 PM Buras W. Russell C. Nguyen K. Garami Z. Guerra M.  
[\*Novel Methods for the Flexible Ultrasound System \(FUS\) utilizing Augmented Reality-based Just-In-Time Procedural Guidance\*](#) **[#17116]**  
We have developed a novel interface for the new Flexible Ultrasound System that enables a minimally trained user to acquire clinically interpretable sonograms autonomously using a HoloLens-based Augmented Reality interface and magnetic GPS for 3-Dimensional procedural guidance
- 2:30 PM Break **[#17117]**

Wednesday, January 25, 2017

Space Radiation Carcinogenesis I

1:00 PM

Yacht

Chair: AI Fornace

- 1:00 PM Fornace A. Shay J. Meltzer P. Brenner D. Datta K.  
*A STRATEGY FOR RISK ASSESSMENT AND MODEL DEVELOPMENT TO EVALUATE THE INCREASED INCIDENCE AND PROGRESSION OF GASTROINTESTINAL (GI) CANCER BY SPACE RADIATION: GI-NSCOR* [#17522]  
An overview and update of the GI NSCOR program will be presented
- 1:25 PM Shay J.  
*MOUSE MODELS OF CANCER RISK AND PREVENTION FROM SPACE RADIATION* [#17523]  
Biological countermeasures can reduce the risk of invasive cancers
- 1:45 PM Seidel D. Wahl K. Ford J. Carroll R. Chapkin R. Turner N.  
*DIFFERENTIAL ADULT COLON STEM CELL RESPONSE TO RADIATION SOURCE AND DIETARY INTERVENTION* [#17524]  
Adult colon stem cell proportions are affected by ion source and dietary interventions.
- 2:05 PM Castle K. Lee C. Sachdeva M. Moding E. Williams N. Ma Y. Luo L. Kirsch D.  
*Defining the Role of miR-182 in Radiation-Induced Lymphomagenesis and Lung Tumorigenesis* [#17525]  
Utilizing gain of function and loss of function approaches, we are investigating whether miR-182 functions following radiation to regulate lymphoma or lung tumor development by altering Fbxw7 levels.
- 2:25 PM Discussion [#17526]
- 2:30 PM Break [#17527]

Wednesday, January 25, 2017

Visual Impairment and Intracranial Pressure Analogs and Countermeasures

1:00 PM

Grand Ballroom

**Chairs:** Michael Stenger and Steven Laurie

- 1:00 PM Lawley J. Williams M. Zhang R. Whitworth L. Levine B. Petersen L.  
*Safe and Effective Countermeasures to Reduce Intracranial Pressure and Ameliorate Visual Impairment in Astronauts: The STOP-VIIP Study* [#17587]  
These data suggest that low level LBNP reduces ICP and thus may be an appropriate physiologically driven countermeasure to reduced ICP in zero gravity.
- 1:15 PM Anderson A. Rieke C. Fellows A. Buckey J.  
*FEASIBILITY OF DPOAE MAPPING AS AN IN-FLIGHT MEASURE OF INTRACRANIAL PRESSURE IN SPACE* [#17588]  
We evaluated the use of distortion product otoacoustic emission mapping (DPOAE mapping) as a method to assess cochlear regions most affected by changes in the force of gravity acting on the ear and fluid shift.
- 1:30 PM Macias B. Balasubramanian S. Huang A. Cole C. Foulk J. Kesari S. Liu J. Stenger M. Ebert D. Lee S. Laurie S. Sargsyan A. Feiveson A. Hargens A.  
*Validation of a Cephalad Fluid Shift Countermeasure* [#17589]  
This project seeks to determine if thigh cuffs can decrease intracranial pressure, choroid engorgement, and intraocular pressure when applied during an acute 15° head-down tilt microgravity analog.
- 1:45 PM Strangman G. Ikvovic V. Zhang Q. Baggish A. Dentinger A. Rosenthal E. Bershad E.  
*Testing Mechanical Countermeasures for Cephalad Fluid Shifts* [#17590]  
We are adapting and testing two commercial devices in clinical and spaceflight-analog settings—Lymphapress and Kaatsu bands—for their ability to help reduce elevations in intracranial pressure (ICP) and VIIP-related symptoms.
- 2:00 PM Scott J. Martin D. Crowell B. Goetchius E. Cox R. Matz T. Ritter M. Dewitt J. Ploutz-Snyder R. Stenger M. Haykowsky M. Ploutz-Snyder L.  
*INFLUENCE OF EXERCISE MODALITY ON CEREBRAL-OCULAR HEMODYNAMICS AND PRESSURES* [#17591]  
Preliminary results suggest that high-intensity interval exercise acutely increases cerebral blood flow, internal jugular pressure, and estimated translaminar pressure gradient.
- 2:15 PM Bershad E. Venkatasubba Rao C. Suarez J. Sangi-Haghpeykar H. Calvillo E. Stevens B. Damani R. Clark J. Kramer L. Hasan K. Basner M. Strangman G. Stetefeld H. Dohmen C. Marshall-Goebel K. Stern C. Limper U. Ritwegger J. Mulder E. Donoviel D.  
*SPACE-COT: Studying the Physiological and Anatomical Cerebral Effects of Carbon Dioxide and Head Down Tilt: An International Collaborative Project with the German Aerospace Center (DLR)* [#17592]  
We studied the effects of 12 degree head down tilt and atmospheric carbon dioxide on brain, cognition and systemic physiology
- 2:30 PM Break [#17593]

Wednesday, January 25, 2017

Characterizing Behavioral Changes in Isolation and Confinement

3:00 PM

Galleon II & III

**Chairs:** Tina Holden and Kristine Ohnesorge

- 3:00 PM Roma P. Waggoner L. Hienz R. Binsted K. Hursh S.  
*Cooperation, Cohesion, and "Social Personality" in Isolated, Confined, and Extreme Environments* [#17032]  
We will present preliminary analyses of cooperative behavior, group cohesion, and individual- vs. team-level sources of variance therein based on longitudinal data from multiple HERA and HI-SEAS missions.
- 3:15 PM Caldwell B. Binsted K.  
*FREQUENCY OF HI-SEAS CREW COMMUNICATIONS TO MISSION SUPPORT DURING 4-, 8-, AND 12-MONTH SIMULATED PLANETARY EXPLORATION MISSIONS* [#17033]  
We will present preliminary analysis of crew communication frequency with MS by six member crews performing planetary exploration operations and behavioral performance tasks during a 4-month, 8-month and one-year HI-SEAS analog mission.
- 3:30 PM Webb J. Olenick J. Dixon A. Dishop C. Binsted K. Chang C. Kozlowski S.  
*COMPARING TEAM FUNCTIONING OF THREE TEAMS LIVING IN THE HAWAII SPACE EXPLORATION ANALOG AND SIMULATION* [#17034]  
We present findings from three teams living in the Hawai'i Space Exploration Analog and Simulation and discuss implications for team functioning in isolated, confined, and extreme environments.
- 3:45 PM Kozlowski S. Chang C. Biswas S.  
*MEASURING TEAM FUNCTIONING VIA MULTIPLE METHODS* [#17035]  
Our ongoing research involves (1) benchmarking team functioning across a range of durations in Antarctic analogs and NASA mission simulations and (2) developing a wireless wearable sensor technology to measure teamwork interactions and design teamwork and cohesion support.
- 4:00 PM Alfano C. Bower J. Simpson R. Connaboy C. Laughlin M. Deng Z.  
*Psychological Risk, Overlap with Physical Health, and Associated Performance in the Human Exploration Research Analog (HERA)* [#17036]  
Presents research delineating specific psychological symptoms that pose threat in isolated, confined and extreme environments.
- 4:15 PM Discussion [#17037]
- 4:30 PM Break [#17038]

Wednesday, January 25, 2017

Monitoring Ocular and Brain Changes to Understand Visual Impairment and Intracranial Pressure

3:00 PM

Grand Ballroom

**Chairs:** Michael Stenger and Brandon Macias

- 3:00 PM Anderson A. Masterova K. Fellows A. Phillips S. Chepko A. Archambault-Leger V. Kattamis N. Knaus D. Zegans M. Buckey J.  
[Role of cranial venous circulation in microgravity-associated visual changes \[#17212\]](#)  
Use of physiological measurements combined with numerical modeling to understand spaceflight-induced visual changes
- 3:18 PM Dentinger A. Ebert D. Garcia K. Sargsyan A.  
[Tissue Doppler Ultrasound for Assessing Intracranial Dynamics \[#17213\]](#)  
A new ultrasound measurement method for assessing intracranial dynamics based on tissue Doppler imaging is explored and the feasibility tested in an elevated intracranial pressure animal study.
- 3:36 PM Parsons-Wingerter P. Vyas R. Murray M. Predovic M. Lim S. Vizzeri G. Taibbi G. Mason S. Zanello S. Young M.  
[MAPPING BY VESGEN OF BLOOD VESSELS IN THE RETINAS OF ASTRONAUTS PRE-AND POST-FLIGHT TO THE ISS \[#17214\]](#)  
Potential contributions of retinal vascular remodeling to VIIP etiology were investigated in Heidelberg Spectralis ® infrared images of crew members acquired pre and post flight to the ISS by NASA's VESSEL GENERATION Analysis (VESGEN) software.
- 3:54 PM Bershad E. Tang R. Prusmack A. Mendoza J. Munoz J. Gutierrez-Flores B. Calvillo E. Ribaric N. Zimmer C. Clayton R.  
[MULTISPECTRAL IMAGING FOR EARLY DETECTION OF OPHTHALMOLOGICAL CHANGES IN IDIOPATHIC INTRACRANIAL HYPERTENSION \[#17215\]](#)  
This is an exploratory study to evaluate the fundoscopic changes in patients with idiopathic intracranial hypertension using a novel ophthalmological imaging technique.
- 4:12 PM Berdahl J. Greenwood M. Beckman J. Tsai G.  
[A Non-Randomized, Open-Label Study to Evaluate the Safety of Negative Pressure Applied to the Periocular Microenvironment Anterior to the Orbital Rim \[#17216\]](#)  
To demonstrate the safety of the Equinox Balance Goggle System (BGS).
- 4:30 PM Break [#17217]

Wednesday, January 25, 2017

Space Radiation Carcinogenesis II

3:00 PM

Yacht

Chair: Michael Weil

- 3:00 PM Weil M. Ullrich R. Story M. Ding L. Hwang T. Emmett M. Yu Y. Bacher J. Halberg R. Raber J. Edmondson E. Ray F. Thamm D. Liber H. Borak T.  
[NASA SPECIALIZED CENTER OF RESEARCH ON CARCINOGENESIS \[#17528\]](#)  
The NASA Specialized Center of Research on Carcinogenesis will identify biomarkers of HZE ion-induced carcinogenesis, examine the mechanisms underlying the increased malignancy of HZE ion-induced tumors, and measure space-relevant dose rate effects on cancer incidence.
- 3:20 PM Edmondson E. Gatti D. Kamstock D. Fallgren C. Ray A. Weil M.  
[Genomic mapping in outbred mice reveals overlap in genetic susceptibility for HZE ion and γ-ray induced tumors \[#17529\]](#)  
Cancer risks for space radiation exposures are determined by genetic background and can be predicted based on epidemiologic data from terrestrial radiation exposures.
- 3:35 PM Aroumougame A.  
[Space Radiation Triggers Cellular Immunity in the Absence of a DNA Repair Factor, RAD51 \[#17530\]](#)  
We have identified a novel molecular reason for space radiation induced cellular immunity
- 3:50 PM Dynan W. Li Z. Jella K. Jaafar L. Wang H. Wang Y.  
[NON-TARGETED EFFECTS OF HZE PARTICLE RADIATION ON DNA REPAIR \[#17531\]](#)  
HZE particle radiation exposure degrades the fidelity of DNA double-strand break (DSB) repair, as measured by a propensity to misrepair new DSBs introduced days or weeks following the initial radiation exposure.
- 4:05 PM Schimmerling, W.  
[THREE: The Health Risks of Extraterrestrial Environments \[ #17039\]](#)  
Present the main features of The Health Risks of Extraterrestrial Environments (THREE), an encyclopedic website whose goal is to present a discussion of the space radiation environment and its health risks to humans.
- 4:20 PM Discussion [#17533]
- 4:30 PM Break [#17534]

Thursday, January 26, 2017

Exercise - Bedrest and International Space Station

8:00 AM

Yacht

**Chairs: Meghan Downs and Jessica Scott**

- 8:00 AM Dillon L. Downs M. Scott J. Ploutz-Snyder L. Buxton R. Goetchius E. Danesi C. Randolph K. Urban R. Sheffield-Moore M.  
[Efficacy of Exercise and a Combined Exercise and Testosterone Countermeasure on Maintaining Metabolic Health during 70-days of Head-Down Bed Rest \[#17048\]](#)  
Sedentary behavior is an independent risk factor for metabolic disease and physical inactivity is generally associated with reduced muscle mass, strength, and aerobic fitness.
- 8:18 AM Downs M. Scott J. DeWitt J. English K. Buxton R. Goetchius E. Crowell B. Ploutz-Snyder R. Ploutz-Snyder L.  
[Individual Variability in Aerobic Fitness and Muscle Strength Adaptations to 70 Days of Bed Rest and Exercise Training \[#17049\]](#)  
Change in VO2pk and muscle strength in response to disuse and exercise was highly variable among individuals.
- 8:36 AM Ploutz-Snyder L. Scott J. English K. Buxton R. Goetchius E. Ryder J. Ploutz-Snyder R. Downs M.  
[SPRINT Exercise In Bed Rest and Spaceflight \[#17050\]](#)  
The SPRINT exercise program has been evaluated as a multi-system countermeasure in both bed rest and spaceflight
- 8:54 AM Ploutz-Snyder L. Downs M. Buxton R. Goetchius E. Ryder J. Ploutz-Snyder R. Scott J.  
[Time Course Of Muscle Loss With Bed Rest \[#17051\]](#)  
This is the first study to longitudinally follow muscle atrophy under well controlled circumstance
- 9:12 AM Scott J. Martin D. Matz T. Downs M. Ploutz-Snyder R. Ploutz-Snyder L.  
[CHANGES IN CARDIAC MORPHOLOGY AND FUNCTION: IMPLICATIONS OF SPACEFLIGHT, BED REST, AND EXERCISE \[#17052\]](#)  
The similar effectiveness of the SPRINT exercise prescription in both bed rest and spaceflight studies that involve different subjects, environmental conditions and exercise equipment, provides additional support that the exercise prescription itself is effective.
- 9:30 AM Break [#17053]

**Thursday, January 26, 2017**

**Exploration Medical Capability Closed Session II**

**8:00 AM**

**Galleon I**

8:00 AM      Discussion [#17068]

9:30 AM      Break



Thursday, January 26, 2017

Space Radiation Carcinogenesis III

8:00 AM

Galleon II & III

Chair: Edouard Azzam

- 8:00 AM Azzam E. de Toledo S. Colangelo N. Hu T. Domogauer J. Schwartzkopf C. Moore L. Howell R. Aisner S.  
[OXIDATIVE STRESS AND THE CANCER RISK OF SPACE RADIATION \[#17535\]](#)  
Exposure of mice to space radiation modulates the abundance of hematopoietic cells and inflammatory cytokines
- 8:20 AM Patel R. Gerson S. Welford S.  
[The Contribution of Galactic Cosmic Radiation \(GCR\) exposure to Hematopoietic Stem Cell Dysfunction and Oncogenesis \[#17536\]](#)  
Our data showed that MMR defects in HSCs leads to sensitization to radiation induced hematopoietic malignancy, and that radiation quality effects exacerbate the sensitivity.
- 8:40 AM Smilenov L. Hoehn D. Serban G. Vlad G. Young E.  
[The effect of high LET radiation on reconstituted in mice human hematopoietic system \[#17537\]](#)  
We present results from ground based in vivo study evaluating the effects of high LET radiation on human immune system reconstituted in mic
- 9:00 AM Porada C. Rodman C. Almeida-Porada G. George S. Moon J. Soker S. Pardee T. Beaty M. Guida P. Sajuthi S. Langefeld C. Walker S. Wilson P.  
[Space Radiation-Induced Risks of Leukemogenesis \[#17538\]](#)  
Exposure of primary human hematopoietic stem/progenitor cells to modeled GCR (56Fe ions) induces T-ALL in vivo.
- 9:20 AM Discussion [#17539]
- 9:30 AM Break [#17540]

Thursday, January 26, 2017

Team, Training, and Performance Metrics

8:00 AM

Hilton Crystal Ballroom

**Chairs:** Gordon Vos and James Garrett

- 8:00 AM Burke S. Driskell J. Howell R. Marlow S. Driskell T. Salas E.  
[Team Roles Revisited \[#17554\]](#)  
We investigate the nature of team roles in long duration exploration missions by conducting an operational assessment combined with data collection in the HERA analog.
- 8:15 AM DeChurch L. Larson L. Jones B. Contractor N. Johnson J.  
[LEADERSHIP EMERGENCE IN SPACE MULTITEAM SYSTEMS \[#17555\]](#)  
We examine leadership issues regarding identity and emergence of leaders at the team and multiteam system levels.
- 8:30 AM Rose R. Zbozinek T. Smith S. Leveton L. Schneiderman J. Arias D. Ahlstrom B. Oftedal A. Craske M.  
[Autonomous Multimedia Stress Management and Resilience Training for Flight Controllers \[#17556\]](#)  
Talk about randomized controlled trial investigating the effectiveness of a self-guided, multimedia stress management and resilience training program in comparison to a wait list control group among NASA flight controllers, instructors and directors.
- 8:45 AM Robinson S.  
[RESULTS OF CUSTOMIZED REFRESHER TRAINING EXPERIMENTS TO BENEFIT LONG-DURATION SPACEFLIGHT CREW TRAINING \[#17557\]](#)  
Results of customized refresher training experiments to benefit long-duration spaceflight crew training.
- 9:00 AM Duda K. Karasinski J. Robinson S. York S. Handley P. Prasov Z. West J.  
[Metrics and Methods for Real-Time Task Performance Assessment \[#17558\]](#)  
Human subject experiment evaluating real-time performance metrics and flight performance feedback during a simulated EVA solar array inspection task using the SAFER jetpack system.
- 9:15 AM Discussion [\[#17559\]](#)
- 9:30 AM Break [\[#17560\]](#)

Thursday, January 26, 2017

Twins I

8:00 AM

Grand Ballroom

**Chairs:** John Charles and Graham Scott

- 8:00 AM McKenna M. Taylor L. George K. Bailey S.  
*ASSESSING TELOMERE LENGTH AND TELOMERASE ACTIVITY IN TWIN AND UNRELATED ASTRONAUTS* [#17573]  
We are assessing changes in telomere length and telomerase activity associated with spaceflight in twin and unrelated astronauts and age/gender-matched controls over time.
- 8:15 AM Feinberg A. Rizzardi L.  
*COMPREHENSIVE ANALYSIS OF DIFFERENTIAL EPIGENETIC EFFECTS OF SPACE TRAVEL ON MONOZYGOTIC TWINS* [#17574]  
To determine whether space-induced exposure causes epigenome alterations, either permanent or reversible, we have utilized cutting edge technology to identify any potential damage and to determine its nature and timing.
- 8:30 AM Mason C. Garrett-Bakelman F. Sheridan C. Gandara J. Lee T. Grills G. Melnick A.  
*The Dynamic Landscape of Genetic, Epigenetic, Transcriptional, and Epitranscriptomic Changes During Human Space Travel* [#17575]  
Through comparisons between the subjects and serial time points and to published data, we will assess space flight's effects on the landscape of epigenetic changes to DNA and RNA, including responses to vaccinations, and for similarities to changes detected during aging and human disease
- 8:45 AM Smith S. Heer M. Zwart S.  
*Biochemical Profile: Homozygous Twins and a 1-year ISS Mission* [#17576]  
A review of the Biochemical Profile study conducted as part of the Twins Study.
- 9:00 AM Hillary R. Li L. Leary E. Mignot E.  
*INFLUENCE OF FLU IMMUNIZATION ON T CELL REPERTOIRE IN NASA TWINS* [#17577]  
BACKGROUNDThe aim of this study was to compare the effect of flu immunization on T cell receptor (TCR) repertoire, with the ultimate goal to extend the study to examine effect of spending time in space on human immune responses.
- 9:15 AM Discussion [#17578]
- 9:30 AM Break [#17579]

Thursday, January 26, 2017

Exercise Countermeasures and Technology

9:45 AM

Yacht

**Chairs:** Andrea Hanson and Kirk English

- 9:45 AM Feltz D. Samendinger S. Hill C. Ede A. Kerr N. Pivarnik J. Ploutz-Snyder L. Winn B.  
[Can a Cyber Partner Boost Motivation to Maintain Long-term Intense Exercise? \[#17054\]](#)  
This project focused on boosting motivation for vigorous exercise, with participants similar in age and fitness to astronauts, using an exercise video game and software-generated partners, exercising together over a 24-week exercise regimen.
- 10:03 AM Perera J. Hanson A. English K. Frank A. Hardy M. Sándor A. Vu L. Benson E. Kim H. Williams T. Amonette W.  
[NextGen Crew Countermeasure Software for Exploration Mission Support \[#17055\]](#)  
In this project, we will create and evaluate a common portal to integrate a custom software architecture to support exercise countermeasures and test two plug-in features capable of enhancing the current resistance exercise and metabolic conditioning experiences.
- 10:21 AM Hanson A. Kalogera K. Sandor A. Hardy M. Frank A. Amonette W. English K. Williams T. Perera J.  
[EVALUATION OF THE NEXT-GEN EXERCISE SOFTWARE INTERFACE IN THE NEEMO ANALOG \[#17056\]](#)  
Results of the NextGen Software evaluation during the NEEMO21 analog mission are presented here.
- 10:39 AM Newby N. Fincke R. Hanson A.  
[COMPARISON OF X2 AND XSSENS FORCE SHOES \[#17057\]](#)  
This abstract covers testing and model development for the X2 and XSens force shoes.
- 10:57 AM Ade C. Sutterfield S. Alexander A. Baumfalk D. Caldwell J. Didier K. Dzewaltowski A. Hammer S. Barstow T.  
[IDENTIFICATION OF AEROBIC FITNESS STANDARDS FOR EXPLORATION MISSION TASKS \[#17058\]](#)  
As we transition to deep space journeys and Mars missions the risk of a severe reduction in aerobic capacity is very high.
- 11:15 AM Break [#17059]

Thursday, January 26, 2017

How To Conduct A Better Flight Study

9:45 AM

Galleon I

**Chairs:** Steven Platts and Suzanne McCollum

- 9:45 AM Platts S. Bauer T. Rodgers S.  
[\*THINGS THAT SCIENTISTS DON'T UNDERSTAND ABOUT NASA SPACEFLIGHT RESEARCH\* \[#17141\]](#)  
In order to maximize a large number of research studies aboard the ISS, ISSMP uses the study requirements provided by the principle investigator to integrate all of this work into the astronauts' complement.
- 10:00 AM Hougland E. Lawless M. Hougland L. Norwood K.  
[\*Preparing for a flight study-definition phase\* \[#17142\]](#)  
The Definition Phase for flight research, the process of taking a protocol designed for the lab and making it work in Low Earth Orbit, is an essential piece of conducting a successful spaceflight study
- 10:15 AM Tucker K. Gavalas L.  
[\*How to conduct a better flight study You Want to Fly What Kind of Hardware?\* \[#17143\]](#)  
A successful flight experiment hinges on selecting hardware that is both compatible with ground scenarios and the flight environment.
- 10:30 AM Perry M. Kosobud E. Schwanbeck N.  
[\*ISSMP – WHAT TO EXPECT DURING IN-FLIGHT OPERATIONS\* \[#17144\]](#)  
Executing human research on the ISS requires investigators to navigate a unique risk environment. A balanced requirement set affords the ability to remain flexible for each subject's data set while protecting the study's integrity across all subjects and research objectives.
- 10:45 AM Morshedi P.  
[\*Ensuring Postflight Mission Success: Getting Your Flight Study Past the Finish Line\* \[#17145\]](#)  
This presentation will provide strategic guidance to ISS human research personnel to ensure successful postflight data collection in an increasingly competitive landscape.
- 11:00 AM Discussion [#17146]
- 11:15 AM Break [#17147]

Thursday, January 26, 2017

Inter-Agency Approaches to Radioprotection

9:45 AM

Galleon II & III

**Chairs:** Lisa Carnell and Lany Taliaferro

- 9:45 AM Chang P.  
*Translating Discovered Drug Candidates from the Benchtop to Human Use - An Overview of Product Development Process* [#17189]  
As astronauts travel through space in relatively short durations in near earth orbits, they experience physiological changes caused by weightlessness.
- 10:05 AM Rios C. Cassatt D. DiCarlo A. Satyamitra M. Taliaferro L. Hackett C.  
*The NIAID Radiation Nuclear Countermeasures Program: An Overview* [#17190]  
In 2004, the U. S. Department of Health and Human Services tasked the NIAID, NIH with the responsibility to identify, characterize, & develop medical countermeasures & biodosimetry tools for deployment in the event of a radiation public health emergency.
- 10:25 AM Wathen L. Shen B. Eder P. Wallace R. Boston D.  
*Enhancing National Preparedness through Biodosimetry* [#17191]  
In all potential radiation disasters, the population is likely to encounter a number of complex radiation exposure scenarios, including different dose ranges and dose rates.
- 10:45 AM Prasanna P.  
*Radioprotectors and mitigators for improving radiotherapy* [#17192]  
Radiotherapy is an important treatment modality for many malignancies, either alone or as a part of combined modality treatment.
- 11:05 AM Discussion [#17193]
- 11:15 AM Break [#17194]

Thursday, January 26, 2017

Tools and Methods for Habitability

9:45 AM

Hilton Crystal Ballroom

**Chairs:** Mihriban Whitmore and Alexandra Whitmire

- 9:45 AM Stuster J. Adolf J. Byrne V. Greene M.  
[Generalizable Skills and Knowledge for Exploration Missions \[#17567\]](#)  
This presentation describes the work completed during the first year of a three-year study to identify the skills and abilities that will be required among the crew of the first human expedition to Mars.
- 10:05 AM Thaxton S. Chen M. Hsiang S. Lim C. Myers J. Wald S.  
[Spacecraft Optimization Layout and Volume \(SOLV\): Development of a Model to Assess Habitable Volume \[#17568\]](#)  
Summary of model development to date for Spacecraft Optimization Layout and Volume (SOLV), a model that will serve as a tool for designers in evaluating habitable volume needs based on mission parameters.
- 10:25 AM Duda K. Steiner, III T. DeFronzo R. DeBitetto P. West J. Chamitoff G.  
[Wearable Kinematic Systems for Quantifying 3-D Space Utilization in the Microgravity Environment \[#17569\]](#)  
Ground-based analog evaluation of a vision+inertial navigation system and development of a self-contained wearable kinematic system.
- 10:45 AM Young K. Rajulu S. Kim H.  
[QUANTIFICATION OF IN-FLIGHT PHYSICAL CHANGES: ANTHROPOMETRY AND NEUTRAL BODY POSTURE \[#17570\]](#)  
ISS study to determine changes in body dimensions and neutral body posture during long duration Missions.
- 11:05 AM Discussion [#17571]
- 11:15 AM Break [#17572]

Thursday, January 26, 2017

Twins II

9:45 AM

Grand Ballroom

**Chairs:** John Charles and Graham Scott

- 9:45 AM Turek F. Vitaterna M. Jiang P. Keshavarzian A. Green S.  
[\*METAGENOMIC SEQUENCING OF THE BACTERIOME IN GI TRACT OF TWIN ASTRONAUTS ON GROUND AND ON ONE-YEAR ISS MISSION\* \[#17580\]](#)  
This project examines the effects of space flight on the gastrointestinal microbiome, as part of an integrated set of –omics studies comparing identical twins, with one twin in space for one year and one twin remaining on Earth
- 10:00 AM Rana B.  
[\*Proteomic Assessment of Fluid Shifts and Association with Visual Impairment and Intracranial Pressure in Twin Astronauts\* \[#17581\]](#)  
We are exploring proteomic signatures and genomic mechanisms underlying space flight-induced VIIP symptoms for the NASA TWINS study.
- 10:15 AM Lee S. Rana B. Stenger M. Sears D. Smith S. Zwart S. Macias B. Hargens A. Sharma K. De Vivo I.  
[\*Metabolomic and Genomic Markers of Atherosclerosis AS RELATED to Oxidative Stress, Inflammation, and Vascular Function in Twin Astronauts\* \[#17582\]](#)  
This study of twins affords a unique opportunity to examine spaceflight-related atherosclerosis risk that is independent of the confounding factors associated with different genotypes.
- 10:30 AM Basner M. Dinges D. Nasrini J. McGuire S. Hermosillo E. Ecker A. Mollicone D. Moore T. Gur R.  
[\*Performance on the Cognition Battery in the TWINS study\* \[#17583\]](#)  
Both twins performed the Cognition test battery, a brief neuropsychological test battery specifically designed for astronauts, before, during, and after the one year ISS mission. First results related to mission phases and time in mission will be reported at the meeting.
- 10:45 AM Mishra T. Piening B. Contrepois K. Ahadi S. Salins D. Snyder M. (Twins Project) N.  
[\*Longitudinal Integrated Multi-Omics Analysis of the Biomolecular Effects of Space Travel\* \[#17584\]](#)  
Integrative analysis of all biomedical and molecular data collected during the Twins Study to produce the singular most comprehensive portrait of the human biophysical response to the rigors of spaceflight
- 11:00 AM Discussion [#17585]
- 11:15 AM Break [#17586]



Thursday, January 26, 2017

**Analog – The Next Best Thing To Being There**

**1:00 PM**

**Galleon I**

**Chairs: Steven Platts and Suzanne McCollum**

- 1:00 PM Spence L. Self A. Keith K.  
[How does HRP do Analogs? Let me count the ways \[#17007\]](#)  
This presentation provides an overview of the different analogs currently used and planned for use by HRP, including characteristics, capabilities and limitations of each analog.
- 1:20 PM Platts S. Primeaux L. Swarmer T. Yarbough P.  
[SCIENCE IN A TEAM ENVIRONMENT \(AKA, HOW TO PLAY NICELY WITH OTHERS\) \[#17008\]](#)  
The purpose of this presentation is to highlight some of the unique aspects of doing HRP spaceflight analogs research.
- 1:40 PM Self A. Huppman S. Spence L.  
[The Nitty Gritty: How We Make Analogs Work \[#17009\]](#)  
This information is intended to help investigators better understand the operational details of the Human Exploration Research Analog (HERA) and the benefits to their research goals.
- 2:00 PM Pietrzyk B. Yarbough P.  
[ISSMP-FLIGHT ANALOGS – “YOU WANT TO DO WHAT?” \[#17010\]](#)  
The roles and responsibilities of investigators in NASA analog studies
- 2:20 PM Discussion **[#17011]**
- 2:30 PM Break **[#17012]**

Thursday, January 26, 2017

Countermeasures for Exploration

1:00 PM

Hilton Crystal Ballroom

**Chairs:** Tina Holden and Diana Arias

- 1:00 PM Wu P. Ott T. Wall P. Morie J. Ladwig J. Miller C. Binsted K.  
*ANSIBLE: Evaluation of a Virtual Reality Ecosystem as a Countermeasure for Behavioral Health Threats in Long Duration Exploration Missions in Isolated, Extreme, and Confined Environments. [#17042]*  
We discuss the results of a 12 month ground based analog study evaluating the use of a virtual reality ecosystem for addressing the challenges of asynchronous communications and Isolated, Extreme and Confined environments.
- 1:20 PM Flynn-Evans E. Martinez S. Murphy C. Gregory K.  
*VALIDATION OF FATIGUE MODEL PREDICTIONS [#17043]*  
Our study involves comparing predictions generated from fatigue models to objective data collected from laboratory and field studies.
- 1:40 PM Brainard G. Hanifin J. Warfield B. Jasser S. Kemp J. Hasher D. Balaicuis J. Panepinto L. Thiessen M. Vadalía S. Disoke F. Nelson N. Byrne B. Pineda C. Gerner E. Clark T. Maida J. Moomaw R. Johnston S. Barger L. Czeisler C. Lockley S.  
*TESTING SOLID STATE LIGHTING COUNTERMEASURES TO IMPROVE CIRCADIAN ADAPTATION, SLEEP, AND PERFORMANCE DURING HIGH FIDELITY ANALOG AND FLIGHT STUDIES FOR THE INTERNATIONAL SPACE STATION [#17044]*  
These studies will help determine if SSLA lighting can be used both to support astronaut vision and serve as an in-flight countermeasure for circadian disruption, sleep disruption and performance deficits on the ISS.
- 2:00 PM Klerman E. Rahman S. Barger L. Lockley S.  
*COMBINATION OF LIGHT AND EXERCISE AS AN EFFICIENT COUNTERMEASURE FOR CIRCADIAN MISALIGNMENT AND OBJECTIVE PERFORMANCE AND SUBJECTIVE ALERTNESS DECREMENTS [#17045]*  
We test the hypotheses that addition of moderate-intensity exercise to short bright light stimuli will increase the circadian phase shift, improve objective performance and subjective alertness during the stimuli, and improve sleep after the stimuli.
- 2:20 PM Discussion [#17046]
- 2:30 PM Break [#17047]

Thursday, January 26, 2017

How We Do Business

1:00 PM

Yacht

**Chairs: Maria Havenhill and Susan Steinberg**

- 1:00 PM Mindock J. Anton W. Lumpkins S. Steinberg S. Arya M.  
[HRP's New Approach to Solicitation Development \[#17148\]](#)  
HRP has implemented a new approach to solicitation development to improve integration between HRP Elements, identify collaborative possibilities between risks, and reduce time between solicitation and selection.
- 1:15 PM Stewart B. Glisan B.  
[YOU'VE BEEN AWARDED A NASA GRANT, NOW WHAT? \[#17149\]](#)  
This session will provide an understanding of the requirements placed on grantees per the Office of Management and Budget (OMB) and NASA Human Research Program.
- 1:30 PM Covington M. Flores M. Neutzler V. Platts S. Schlegel T. Lloyd C.  
[THE MYTH, THE TRUTH, THE NASA IRB \[#17150\]](#)  
We will be presenting the policies that guide a protocol through the NASA IRB and the procedures that principal investigators must take to obtain required IRB approvals for their research studies.
- 1:45 PM Havenhill M. Anton W. Overton E.  
[The Risks of Risks: Managing the Risks Behind Your Mitigations Research \[#17151\]](#)  
HRP manages risks that impact the success of research addressing health and performance risks.
- 2:00 PM Steinberg S.  
[MAKING THE LEAP FROM INDIVIDUAL RISKS TO OPERATIONAL CAPABILITY: NEXT GENERATION VEHICLE HABITAT \[#17152\]](#)  
A framework was developed to integrate and evaluate HRP deliverables that naturally align around internal habitable volume and layout as key drivers of astronaut well-being and performance.
- 2:15 PM Discussion [\[#17153\]](#)
- 2:30 PM Break [\[#17154\]](#)

**Thursday, January 26, 2017**

**Inter-Agency Discussion on Space Radiation**

**1:00 PM**

**Galleon II & III**

**Chairs: Lisa Simonsen and Lisa Camell**

1:00 PM Discussion [#17195]

2:30 PM Break

Thursday, January 26, 2017

Preserving Skeletal Health of Astronauts During Long-Duration Spaceflight

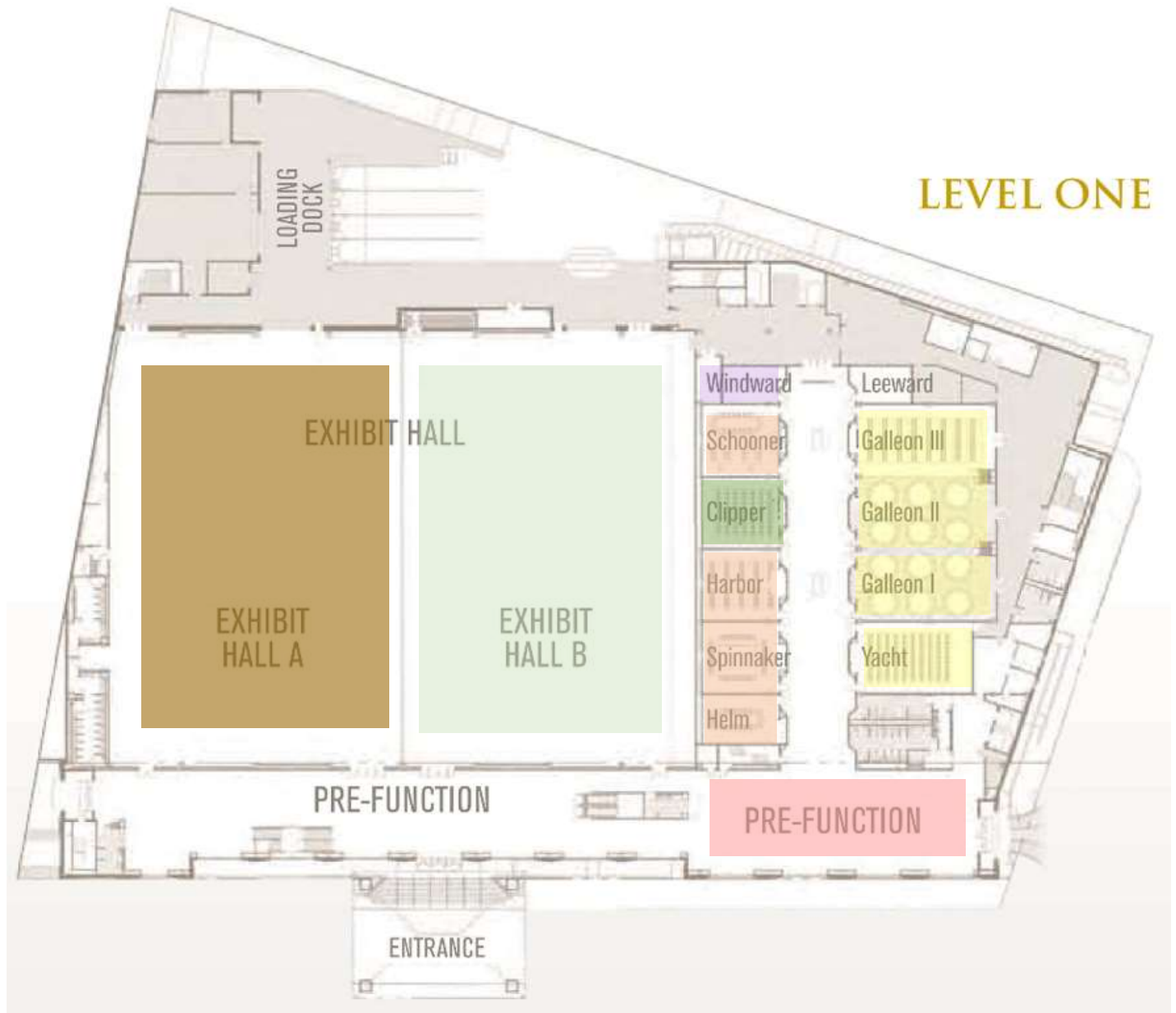
1:00 PM








Grand Ballroom

Chair: Jean Sibonga

- 1:00 PM Smith S. Heer M. Zwart S. Shackelford L.  
[Bone Biochemistry on ISS Missions \[#17493\]](#)  
A review of bone biochemistry data from ISS missions.
- 1:15 PM Rianon N. Edwards B. Nhonthachit P. Messick A. Gagel R. Smith S.  
[Anti-resorptive activity of anti-hypertensive agent ACEi in older men \[#17494\]](#)  
Hypertension (HTN) is associated with bone loss due to activation of the renin-angiotensin system (RAS) which in turn affects bone turnover.
- 1:30 PM LeBlanc A. Matsumoto T. Spector E. Jones J. Shapiro J. Lang T. Shackelford L. Smith S. Evans H. Ploutz-Snyder R. Sibonga J. Keyak J. Nakamura T. Kori K. Ohshima H. Okada A. Yasui T.  
[Bisphosphonates as a Countermeasure to Space Flight Induced Bone Loss: SMO-021 \[#17495\]](#)  
This abstract summarizes results to date on the Bisphosphonate project
- 1:45 PM De Witt J. Buxton R. Guilliams M. Hanson A. Peters B. Scott-Pandorf M. Sibonga J. Ploutz-Snyder L.  
[Relationship between in-flight training load and musculoskeletal health outcomes \[#17496\]](#)  
A retrospective analysis of exercise performed during spaceflight and relationships to bone and muscle strength changes.
- 2:00 PM Hargens A. Chang D. Healey R. Khieu K. Parazynski S. Minkoff L. Bailey J. Sayson J. Lotz J.  
[Risk of Intervertebral Disc Damage after Prolonged Space Flight \[#17497\]](#)  
Our investigation aims to understand this higher incidence of herniated IVDs and back pain.
- 2:15 PM Sibonga J. Spector E. Yardley G. Evans H. Smith S.  
[TRANSLATING BONE RESEARCH DATA TO OPERATIONS – SUMMARY OF A 2016 ASSESSMENT BY BONE RCAP \(RESEARCH & CLINICAL ADVISORY PANEL\) \[#17498\]](#)  
The Bone RCAP recently reviewed the data to-date from the Directed Studies: Hip QCT and FE Strength to assess if and how these data in long-duration astronauts could support decision-making in operations and mission planning.
- 2:30 PM Break [#17499]

# Galveston Island Convention Center Floor Plan



	Concessions		Breakout Sessions		Registration and Check-In
	Poster Sessions		Speaker Ready Room		Ancillary Breakouts
	NSBRI luncheon (Wednesday only)				

*\*Please note the GICC provides complimentary Wi-Fi service for all conference attendees. To accommodate various users, please use access passwords for the following devices:*

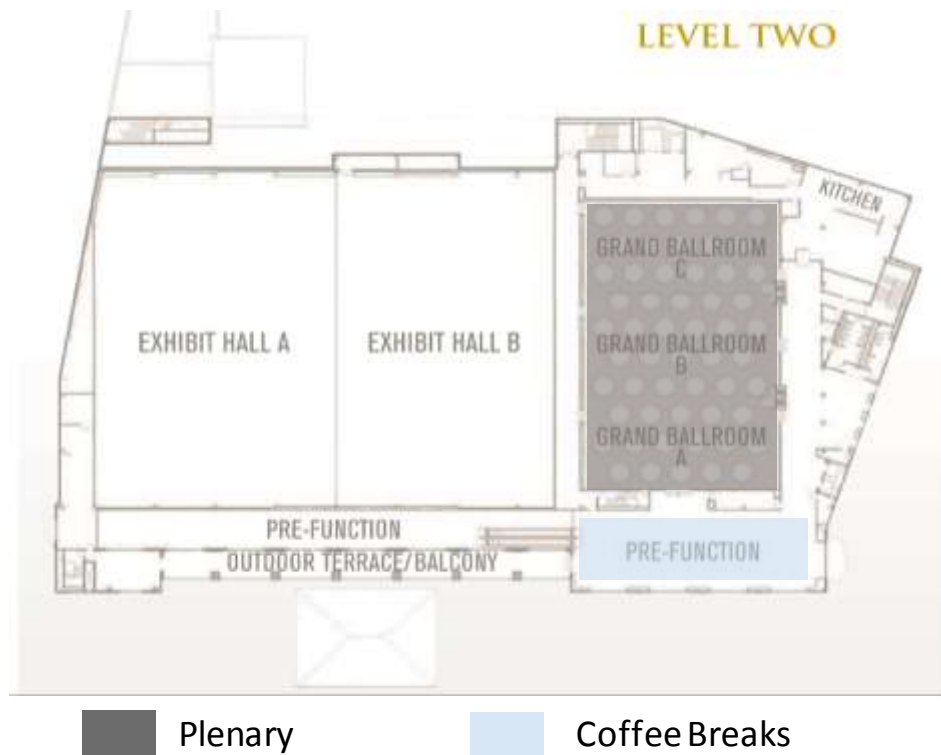
**Laptops-** NASAlaptops

**Mobile devices, i.e. smartphones, tablets-** NASAmobile

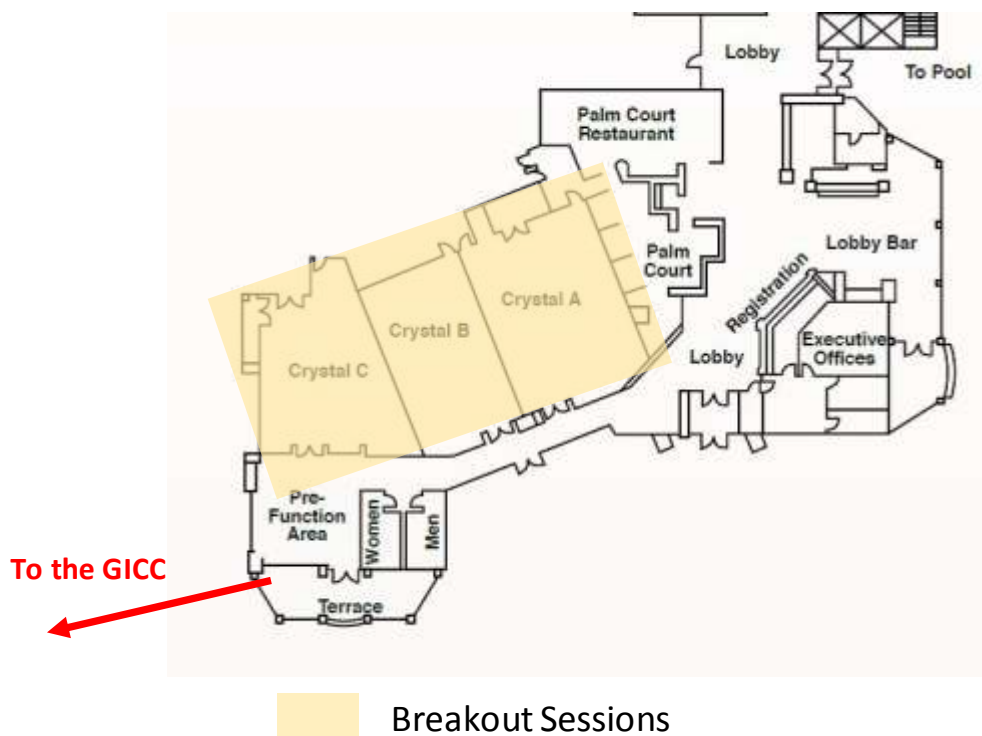
**Password:** NASAHRP1

**Password:** NASAHRP2

# Galveston Island Convention Center Floor Plan



## Hilton Crystal Ballroom Floor Plan



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**Mobile devices, i.e. smartphones, tablets-** NASAmobile

**Password:** NASAHRP1

**Password:** NASAHRP2